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Domestic Demand is Expanding

And Foreign Business is Maintained—Record Pig Iron Production —Railroads Buying More Freely

ORDERS have been coming so rapidly to finishing mills that sellers are devoting their efforts largely to limiting the business placed on their already well filled order books. In many cases, specifications for the remainder of this year have been filed and automobile companies and others are endeavoring to contract far into the future. Some large buyers would like to contract up to April 1, 1917, but the mills are very conservative.

On the whole, the domestic trade in steel shows signs of expansion over the bookings for September, which with large steel companies were heavy. Some steel bar buyers have offered premiums for early delivery, but these are not being accepted. The Steel Corporation's September bookings will show a moderate increase over August. Although the Corporation is running at very nearly full capacity, the starting of the Columbus plant is still indefinite. Another Cleveland furnace of the American Steel & Wire Co. has resumed.

Iron Ore

Owing to the very active demand for vessels for the movement of grain from upper lake ports, shipments of ore for September, although the largest for any September in the history of the trade, fell below the 8,000,000 tons expected, the total being 7,863,146 tons. Owing to the high ocean freights on ore, foreign grades are almost entirely excluded from American markets.

Sheets and Plates

The Ward line has placed orders for two very large vessels with the Cramp yard and 12,000 to 15,000 tons of steel will be required. It is estimated that there are fully 25 vessels pending in the east and the outlook for ship builders in that part of the country is very bright. The sheet market is strong, as the demand is active and the output has been reduced, owing to the fact that sheet bars are scarce and high, some mills, which usually make sheet bars, being employed in rolling rounds for the manufacture of shrapnel.

Pig Iron

While there is considerable activity in pig iron at Chicago, and prices throughout the country are being well maintained, sales in most centers are light. Inquiries for from 15,000 to 20,000 tons for export are pending, but the very high ocean freights make shipment to foreign countries almost impossible.

Wire

Wire mills are overwhelmed with specifications and with inquiries for new business for domestic consumption as well as for export. Recent advances are maintained and considerably higher quotations are being made on bolt wire and galvanized wire fencing. An advance of about 5 per cent on the larger sizes of bolts has been made. Some makers of rivets are also asking considerably higher prices. Boiler tubes have been advanced $2 per ton.

Pig Iron Output

Production of coke and anthracite pig iron for September was the largest in the history of the country, the total being 2,834,342 tons, compared with 2,774,825 tons in August and with 2,816,825 tons in May, 1913, which month held the record until it was broken by September. The yearly rate, as indicated by September production, is 34,500,000 tons. The gain continues to be largely in the furnaces producing steel-making iron. The present outlook is that October will show a still greater gain.

Railroad Buying

The placing of orders by railroads is showing increasing activity from week to week. The latest rail orders include 11,000 by the Union Pacific, 8,000 by the Chicago & Great Western, 5,000 additional by the New York Central, 5,000 by the Nickel Plate, 5,000 by the Pittsburgh & Lake Erie, and 8,000 by the Nashville, Chattanooga & St. Louis.

Strikers Return to Work

Employes of Cleveland Automatic Machine Co. Agree to Terms Offered by President A. L. Garford

Cleveland, Oct. 6.—The return to this city from New York of A. L. Garford, president of the Cleveland Automatic Machine Co., marked the rapid settlement of a strike which had tied up the company's plant for several days, the employes returning to work this morning at the terms offered them by Mr. Garford. These include an eight-hour day at eight hours' wages, time and one-half for the ninth hour, and time and three-quarters for the tenth and additional hours. Former agitators are to be reinstated, but a strictly open shop policy is to be maintained. The affair could have been easily settled without a strike, declared Mr. Garford. "This company has, for a quarter-century, attempted to maintain claim to recognition as one of the fairest and most progressive open shop factories in America," he said.

"In the dull period before the European war, this company was almost alone in refusing to cut wages, and at one time during that period no less than $400,000 worth of our product was lying on our hands, for which there appeared no chance of early sale. This activity was maintained simply for the sake of the employes, whom we wished to keep together and tide over the hard times.

"It is no simple matter of 'stand and deliver' to change over a large industrial enterprise operating on a 10-hour basis to an eight-hour basis at a moment's peremptory notice, regardless of financial losses incurred. It is only natural to expect that when a firm has made repeated sacrifices for the sake of its employes for many years during hard times, it has an equal right to reciprocity from them during a stress of emergency such as now confronts American manufacturers.

"At this time," added Mr. Garford, "I wish to deny flatly the insinuations that the Cleveland Automatic Machine Co. is a 'munition' plant. This company has never made one dollar's worth of munitions of war, nor has it built any special machine for the manufacture of such munitions. Our regular machine can be readily adapted by any workman to the production of shrapnel shells, just as a draw-shave can be used for making gun stocks. At the present time, we are not selling any automatic machines for export, our entire production being contracted for by customers situated in this country."

J. P. Brophy, general manager of the company, cited many individual cases of men who have been in the company's employ for from 15 to 25 years. "We have consistently gone a step further than business policy dictated," said Mr. Brophy, "in the matter of wages and continuance of men at work regardless of slack business. Our equipment for the safety and comfort of workmen, we believe, ranks with that of any firm in the country. Promotion or discharge has always been a matter of the most careful scrutiny in the interests of justice."

Six Papers

Will be Read at Cleveland Meeting of Iron and Steel Institute

Six major papers will make up the program to be presented at the meeting of the American Iron and Steel Institute at Cleveland, Oct. 22 and 23. In addition, there will be the usual motion picture address and impromptu talks at the evening's banquet. The official program, just announced, is as follows:

Address by the president, Elbert H. Gary, Cleveland and Its Industries.

Electric Furnace for Heating Billets, Castings, etc., Thaddeus F. Baily, president, the Electric Furnace Co. of America, Alliance, O.

Modern Methods of Burning Blast Furnace Gas in Stoves and Boilers, Ambrose N. Diehl, superintendent of blast furnaces, Carnegie Steel Co., Duquesne, Pa.

The Developments of Alloy Steel for Commercial Purposes, Edgar D. Rogers, general sales manager, United Steel Co., Canton, O.

Under-Advertising of the Steel Business, George H. Jones, vice president, Inland Steel Co., Chicago.

Recent Developments in Sintering of Iron Ores, Bethune G. Klugh, engineer, American Ore Reclamation Co., New York.

Casting Steel Ingots, Henry M. Howe, Emeritus Professor of metallurgy, Columbia University, New York City.

Evening.

Moving Pictures, National Tube Co. and American Steel & Wire Co.

Buys Plants

Cincinnati, Oct. 5.—The Cincinnati Screw Co., recently incorporated, has purchased the real estate and equipment of the Cincinnati Screw & Tap Co., including over 100 automatic screw machines from ¾-inch to 2-inch capacity. It has also acquired the Victor Stamping Co., near Loveland, O., and will use both for the manufacture of screws. The price paid for both plants was slightly in excess of $100,000. A consideration in the purchase was that neither plant can be used for the manufacture of war munitions. The new company has begun operations. Among the incorporators are C. H. M. Atkins, B. M. Quillan and H. C. Otherbein.

Boiler Tubes

Are Advanced $2 Per Ton—Pipe Market is Quiet

Pittsburgh, Oct. 5.—Under date of Oct. 1, the National Tube Co. lowered discounts for boiler tubes in less than carload lots one point, which is the equivalent of an advance of $2 a ton. The last previous advance was made July 16. Some makers of wrought iron boiler tubes have announced a similar advance in prices. Demand for boiler tubes is heavy. The market for standard pipe continues rather quiet. Prices are described as firm.

May Enlarge Plant

The receivers of the Central Iron & Steel Co., Harrisburg, Pa., are reported to be considering the material enlargement of the steel works capacity of the company, which at the present time consists of four 50-ton basic open hearth furnaces. In times past, the company has been a considerable buyer in the open market of semi-finished steel, particularly slabs. The present scarcity of merchant crude steel in the country is causing the consideration of plans which will make it more independent of outside supplies. As stated previously, the company also probably soon will blow in one or both of its idle blast furnaces.

Rail Buying More Active

New York, Oct. 6. (By wire.)—Rail buying is proceeding briskly. The Union Pacific has placed 11,000 tons, the Chicago Great Western 8,000 and the New York Central 5,000 additional with Chicago mills. The order to the Illinois Steel Co. of the Chicago & North-Western, reported last week, proves to be 32,000. The Pittsburgh & Lake Erie has placed 5,000 with the Carnegie Steel Co., and the Nashville, Chattanooga & St. Louis 8,000 with the Tennessee company. A western traction line which originally bought a lot from Algoma Steel Co. for summer delivery has placed several thousand tons with domestic mills.

Shell Makers Want Larger Lathes

Orders for 6-Inch to 9-Inch High Explosive Shells Create Demand for Heavy Turning Equipment—Workmen Get Raises

THE feature of leading interest in the machine tool market during September was the greatly increased demand for machinery for making shells of 6-inch and larger diameter. As a result of this heavy buying, all the regular makers of 24-inch to 30-inch swing lathes now are sold as far ahead as the makers of shrapnel-size lathes; in one case a big plant has its large-swing lathe capacity fully contracted for to next September. A great deal of this equipment was purchased by French, English and Italian agents, who scoured the market for all machines of this character available for immediate or early delivery, and, in addition, placed large orders for next year's delivery. These heavy lathes also were bought in large numbers by domestic interests, notably the Bethlehem Steel Co. There is a disposition in the machine tool market to see a connection between these large-swing lathe purchases by domestic interests and large contracts, involving 6-inch to 9-inch shells, which representatives of the French government in New York City now are negotiating. At least 20 concerns are figuring on these contracts and it is believed that formal awards shortly will be made. No details as to the extent of these contracts and the specifications involved have yet been made public, with the exception of the fact that deliveries on them are to be made next year.

Radial Drills Getting Scarce

AS a consequence of this big demand for the larger lathes, and the continued heavy demand for the smaller lathes, a comparatively large number of additional concerns have followed the example previously set for them and departed temporarily from their regular lines of manufacture to engage in the production of lathes. Most of these concerns will produce single purpose lathes, ranging from 18 to 24 inches in diameter, but others are taking up the manufacture of 24-inch swing and larger lathes. In some cases, this tendency is having an adverse effect on other lines of machine tools. For instance, radial drills, for which the demand has been increasing greatly, are becoming scarce by reason of the fact that several well-known manufacturers have stopped producing these machines in order to turn out lathes. In Cincinnati, it is reported, only two of the regular manufacturers of radial drills now are producing these machines at the same rate as formerly. Several concerns engaged on munition contracts, who have been unable to get enough lathes to meet their requirements, have decided to build them themselves. Among these are the E. W. Bliss Co., Brooklyn, which has started work in its own plant on 100 lathes, and the International Steam Pump Co., which probably will make an even greater number.

Strike Movement Spreads

ANOTHER development was the further extension of the strike movement among New England machine shops. There also were indications during the latter part of the month that strikes might develop in the Cincinnati, Cleveland and other middle western districts, but so far no serious troubles have had their inception in those localities. In New England, several strikes, involving many men, broke out toward the end of the month, including those at the plants of the Pratt & Whitney Co., Hartford, Conn., and the Brown & Sharpe Mfg. Co., Providence. During the month a number of concerns followed the example set by others in previous months and granted the demands of their men for an 8-hour day and time and a half pay for overtime. Numerous concerns, however, including the Becker Milling Machine Co., Hyde Park, Mass.; the Sloan & Chace Mfg. Co., Newark, N. J.; the Garvin Machine Co., New York, and others, denied the demands and since have resumed operating after breaking in complements of new men. The latest serious strike reported is that at the General Electric Co.'s, Schenectay, N. Y., plant, where some 10,000 men have walked out.

Automobile and motor truck makers, who have benefited on a large scale by the war were big buyers of machine tools during September, and this also is true of concerns making automobile supplies and accessories. The Morrow Mfg. Co., Elmira, N. Y.; the Pierce-Arrow Motor Car Co., Buffalo; the Autocar Co., Ardmore, Pa.; Cleveland-Canton Axle Co., Canton, O.; Haynes Automobile Co., Kokomo, Ind.; Fuller & Sons Mfg. Co., Kalamazoo, Mich.; S. K. F. Ball Bearing Co., Hartford, Conn.; New Departure Mfg. Co., Bristol, Conn., and other companiees, all bought heavily of machine tools during the month.

Railroads are Shy

RAILROAD buying, although a little improved during September, failed to develop on a large scale. The Illinois Central, Lake Erie & Western, Santa Fe and the Chicago Great Western, all closed for a few tools. The Illinois Central road will make improvements to its Waterloo, Ia., shops, which will cost about $180,000, and the Lake Erie & Western will build new shops at Tipton, Ind. It is expected Armour & Co. shortly will buy equipment for new car shops and other buildings, which, it was announced, would be built at South Omaha, Neb., at a cost of about $250,000. The Burlington railroad still is in the market for a number of tools. The Baltimore & Ohio Terminal railway and the International & Great Northern, each will erect shop additions which are expected to lead to buying of equipment. The Seaboard Air Line added to its purchases of the preceding month by buying some tools in September. The Lehigh & New England railroad decided to postpone buying on its list. The Baltimore & Ohio and the St. Louis & San Francisco railroads issued short lists during the month.

Great activity characterized the crane market during the past month, especially in the east. The Maryland Steel Co. bought 12 cranes, Wm. Cramp & Sons Ship & Engine Building Co. 30 cranes and other crane buyers of importance included the Carnegie Steel Co., Republic Iron & Steel Co., Petroleum Iron Co., Fore River Ship Building Corporation, Bethlehem Steel Co., and others. Some further large orders for locomotive cranes were placed from France and Russia.

Pig Iron Output Sets New Record

Production in September Exceeds Any Previous Month—Average Daily Output Rises While 20 Stacks Relight

TEN MONTHS after the smallest monthly pig iron production of the recent decline was shown, the blast furnace industry of the country showed its recuperative powers by producing the largest tonnage in the history of the country. The output of coke and anthracite pig iron in September was 2,834,342 tons. As shown in the accompanying table of monthly production records, this excels the previous high water mark of May, 1913, by 18,000 tons.

MONTHLY PRODUCTION.

	1915.	1914.	1913.
January	1,591,024	1,879,336	2,787,800
February	1,666,592	1,888,607	2,578,670
March	2,046,280	2,341,551	2,762,823
April	2,114,518	2,261,501	2,754,353
May	2,255,157	2,097,019	2,816,825
June	2,369,932	1,904,566	2,616,883
Total 1st half	12,043,503	12,372,580	16,317,354
July	2,563,311	1,955,324	2,558,275
August	2,774,825	1,996,483	2,537,018
September	2,834,342	1,882,718	2,494,098
October	.....	1,767,227	2,539,924
November	.....	1,501,269	2,229,960
December	.....	1,495,325	1,976,138
Total 2d half	.....	10,598,346	14,335,413
Grand total	20,215,981	22,970,926	30,652,767

The yearly rate of production maintained during September was 34,500,000 tons. This figure is the closest ever reached to the theoretical total capacity of the country, which has been set at about 35,000,000 tons. This record was made by only 266 blast furnaces, compared with 306 active in February, 1913. Of the idle stacks, therefore, it is certain that at least 40 more could operate on comparatively short notice, bringing the yearly rate well above the former theoretical capacity. This rate compares with an actual production of 23,000,000 tons in 1914.

The gain in production since last December, which marked the low point of the decline, is 1,340,000 tons or 90 per cent. The gain over September of last year is 950,000 tons or 34 per cent. It is only four months since the total for any month this year exceeded that for the corresponding month of last year.

DAILY AVERAGE RECORD.

	Tons.
September, 1915	94,478
February, 1913	92,095
January, 1913	89,929
December, 1912	89,590
November, 1912	87,985
February, 1910	86,748
December, 1909	86,539
November, 1909	84,425
October, 1909	84,001
September, 1909	79,186

September's production showed a gain of 59,517 tons over August, when 2,774,825 tons were produced. This record was made in a 30-day month, so that the average daily production for September, which was 94,478 tons, shows a gain of 4,968 tons over August with 89,510 tons. The average daily production last month also establishes a new record, as shown in the accompanying table of daily average records.

MONTHLY PRODUCTION RECORD.

	Tons.
September, 1915	2,834,342
May, 1913	2,816,825
January, 1913	2,787,800
December, 1912	2,777,292
October, 1912	2,683,645
December, 1909	2,682,702
October, 1909	2,604,037
September, 1909	2,375,589
October, 1907	2,359,690

The merchant furnaces made the larger comparative gain for the month. The production of merchant iron in September was 681,411 tons, compared with 652,067 tons in August, a gain of 29,344 tons. The steel works furnaces produced 2,124,288 tons in September and 2,091,484 tons in August, a gain of 32,804 tons. The average daily production of merchant iron in September was 22,714 tons, compared with 21,034 tons in August, a gain of 1,680 tons. The steel works furnaces averaged 70,810 tons in September, as compared with 67,467 tons in August, a gain of 3,343 tons.

AVERAGE DAILY PRODUCTION.

	1915.	1914.	1913.	1912.
January	51,323	60,624	89,929	66,220
February	59,521	67,450	92,095	72,372
March	66,009	75,534	89,123	77,791
Apr.	70,484	75,383	91,812	79,254
May	72,747	67,646	90,865	80,753
June	78,998	63,486	87,229	81,125
July	82,687	63,075	82,525	77,502
August	89,510	64,403	81,839	80,650
September	94,478	62,757	83,137	81,482
October	.....	57,007	81,933	86,569
November	.....	50,042	74,322	87,985
December	.....	48,236	63,746	89,590
Average	74,051	62,934	83,980	80,124

The net gain in active furnaces for the month was 20, 266 being active on September 30, compared with 246 on the last day of August. This is the largest number of stacks active since June, 1913. Comparing September with last November, the low point in stack activities, a gain of 116 stacks, or 77 per cent, is shown. The largest number of stacks in blast in recent years was 306 on Feb. 28, 1913. At that time, however, more small merchant furnaces were active, so that September established a new record with fewer active furnaces. Thirteen merchant furnaces were relighted last month and one was blown out, a net gain of 12. Nine steel works furnaces blew in and one blew out, a net gain of eight. In all, 22 furnaces were relighted and two blown out.

The production of ferro in September was 21,288 tons, compared with 18,907 tons in August, a gain of 2,381 tons. The output of spiegel last month was 7,355 tons, against 12,367 tons in August, a loss of 5,012 tons.

The merchant furnaces blown in

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SEPTEMBER PIG IRON

States.	No. of stacks.	No. in blast last day of month. Sept.	Aug.	Total tonnage made. Merchant.	Non-Merchant.	——Totals—— Sept.	Aug.
Pennsylvania	156	112	104	169,575	1,023,644	1,193,219	1,174,529
Ohio	73	53	50	170,697	454,572	625,269	640,046
Alabama	45	23	20	126,185	61,001	187,186	180,705
Virginia	22	6	5	19,391	.....	19,391	19,961
New York	26	19	18	79,949	113,021	192,970	194,295
New Jersey	6	1	1	6,232	.....	6,232	6,800
Illinois	26	20	18	29,765	250,894	280,659	249,288
Colorado	6	2	2				
Indiana	10	10	10	30,209	195,273	225,482	207,362
Maryland	4	3	3				
Wisconsin	6	4	3				
Kentucky	7	2	1				
West Virginia	4	3	3	25,010	25,883	50,893	45,537
Tennessee	18	5	5				
Washington	1	0	0				
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	1	1	1	24,398	.....	24,398	25,028
Michigan	3	2	2				
Missouri	1	0	0				
Spiegel—All states...						7,355	12,367
Ferro—All states....						21,288	18,907
Totals	420	266	246	681,411	2,124,288	2,834,342	2,774,825

Dinkey Resigns Carnegie Presidency

And Becomes Head of Midvale Steel & Ordnance Co.—Succeeded by Homer D. Williams—Many Rumors About Consolidations

Alva Clymer Dinkey, Oct. 2, resigned as president of the Carnegie Steel Co., the largest single unit of the United States Steel Corporation, to become president of the newly incorporated Midvale Steel & Ordnance Co., Philadelphia, which was recently acquired by a group of prominent capitalists headed by William Ellis Corey, formerly president of the Corporation. Mr. Corey resigned the Midvale presidency to become chairman of the board of directors. Mr. Dinkey, one of the most

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prominent officials identified with the steel industry, has been succeeded by Homer David Williams, superintendent of the Duquesne Steel Works of the Carnegie company.

The shift of Mr. Dinkey from the Carnegie company, with which he had been identified since May 21, 1879, when he entered the Edgar Thomson Steel works as a water boy, naturally is associated with rumors of active negotiations for change of control in other steel companies. No official announcement has been made, however, relative to the consolidation of a number of independent interests. Efforts to verify reports of steel company mergers have been ineffectual.

Like Andrew Carnegie, Charles M. Schwab, William Ellis Corey, James A. Farrell and other captains of the steel industry, Mr. Dinkey has had a picturesque career. His resignation not only caused surprise, but created a feeling of regret among his friends and associates at Pittsburgh. Mr. Dinkey was born in Weatherly, Carbon county, Pa., Feb. 20, 1866, and, when a lad, accompanied his parents, Reuben and Mary Elizabeth Dinkey, to Braddock, Pa., where he completed his education. He was first employed as a water boy in the Edgar Thomson Works at Braddock, entering the mill when 13 years old. In 1883, he became telegraph operator at that plant, having studied telegraphy during spare moments. He left the company two years later to become a machinist at the Pittsburgh Locomotive Works, in old Allegheny; after four years' experience in this work, he accepted a position as an expert machinist for the McTighe Electric Co., Pittsburgh. In 1889, Mr. Dinkey returned to the Carnegie company, to become secretary to the general superintendent of the Homestead Steel Works, in which capacity he remained until 1893, when he entered the electrical department of the mill. Subsequently, he was appointed superintendent of the electric light and power plant, serving in that capacity in 1898 and 1899. Mr. Dinkey was made assistant general superintendent of the Homestead works in 1899, and was appointed general superintendent of the plant, April 1, 1901. On Aug. 1, 1903, 24 years after entering the employ of the company, he was elected president of the Carnegie Steel Co., to succeed William E. Corey, who was elected president of the Corporation.

From a poor boy, Mr. Dinkey rose from the humblest position in the Carnegie company to the highest office offered by the subsidiary interests of the United States Steel Corporation. Mr. Dinkey is an officer and director of: The Carnegie Steel Co., the H. C. Frick Coke Co., the Pittsburgh & Lake Erie railroad, the Mellon National Bank, the Monongahela Trust Co. of Homestead, and the Hays National Bank of Hays, Pa. He is a member of: The American Society of Electrical Engineers, the American Society of Mechanical Engineers, the American Society of Mining Engineers, the American Society for the Advancement of Science, the Engineers' Society of Western Pennsylvania, the Academy of Science and Art, and is a trustee of the Carnegie Institute of Technology and the Carnegie Hero Fund Commission. He belongs to a number of prominent social organizations in New York and Pittsburgh.

William Whigham, formerly assistant to Mr. Dinkey, has been made vice president; Col. H. P. Bope and N. W. Blackburn remain vice presidents.

William Macurdy Bailey, who has been private secretary to Mr. Dinkey, former president of the Carnegie

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Steel Co., will accompany Mr. Dinkey to Philadelphia. Mr. Bailey has been employed by the Carnegie Steel Co. for 15 years and has been secretary to Mr. Dinkey for eight years.

The going of Mr. Dinkey from Pittsburgh marks the passing from the ranks of Steel Corporation officials the last of a remarkable group, referred to as the "big three", all of whom rose to prominence in the Pittsburgh district. These men are Mr. Schwab, Mr. Corey and Mr. Dinkey, the first two of whom have been presidents of the Corporation.

Mr. Dinkey's successor, Homer D. Williams, is ably qualified to become president of the Carnegie Steel Co. He was born Aug. 19, 1863, in Johntown, Pa., where he received his early education. In 1880, he entered the

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THE OPEN HEARTH

Safety First Vs. Bravado

COMPLAINT is often made by employers, safety engineers, and foremen, that in spite of the safeguards installed on and about perilous machinery, switchboards, etc., injuries occur nearly as frequently as before. It is further complained that those injured suffer as a result of their own carelessness and disregard warnings, although they are perfectly aware of the danger they incur. This is said to be especially true in the case of men handling high voltage electrical equipment, who seem to display a certain bravado in their operation of destructive currents. To supplement the mechanical safeguards now so widely used employers and safety experts discuss educational campaigns; but knowledge without its direct application is in vain.

Assuming that it is the child-like, the primitive in man which leads him not only to ignore the warnings posted for his own safety, but to perform foolhardy "stunts", possibly as an evidence of his skill and courage, the methods used to bring him to a realization of his foolhardiness must be more or less primitive, too. In this regard it is interesting to note the means employed in teaching very young children or animals. The latter are invariably rewarded for the successful achievement of whatever trick or other act they are learning. The former, in addition to the reward, are encouraged to a sense of worth and of kindred responsibility with their elders. This feeling of being a responsible part of a reasoning, directing social organization is one of the most powerful of developing forces.

The method adopted by several factories, of permanent awards for safety suggestions by employes, would seem to carry a strong appeal, not only to the individual's desire for financial betterment, but to his feeling that he is an active factor in the government and guidance of his fellow men.

The Human Side of Industry

IMPORTANT questions relating to the human side of industry, especially as to problems of the foundry, were discussed in the admirable annual address of President R. A. Bull, of the American Foundrymen's Association, at the annual meeting at Atlantic City last week. Mr. Bull pointed out that there is danger of too much stress being laid upon the displacing of men with mechanism. He said that the whole trend of industrial progress creates a greater need today for skilled mechanics in diversified lines than ever before and he believed that employers ought to take good care of their artisans and help to make them more efficient. He pointed out that there is a limit beyond which human endurance should not be tested and declared that men ought to be given occasional moments of partial relaxation, even during working hours. These and other observations of Mr. Bull are in keeping with the progressive ideas for which he has been sponsor during the time that he has been president of the association, which is indeed fortunate in being able to obtain his services for another year.

In another address, last week, which was delivered before the Cleveland Chamber of Commerce, Harry Tipper, manager of the advertising department of the Texas Co., of New York, dwelt upon the importance of some phases of the human side of industry. He said that in making promotions the usual rule is to advance the man who can get out the most product and little, if any, weight is attached to the man's ability to understand human nature. Of course it is not easy to measure that ability, but a keen observer can form some idea as to how much of it a man possesses, and we believe that Mr. Tipper is right in saying that more attention should be given to this subject.

The recent visit of John D. Rockefeller Jr. to the coal mines and steel plants of Colorado is in harmony with the idea of getting into closer relations with the men. Under present industrial conditions, it is impossible for the employer to know his men as he did in the days of infant industries, when every employe was known personally by his employer, but more can be done to improve the personal relations of the employers and the employes. All such efforts will tend toward the promotion of industrial peace which this country ought to enjoy at a time when it is able to keep out of the great struggle in which European nations are engaged.

Calculus and Courtesy

ONE OF the nation's biggest annual engineering conventions was in full swing. At the speaker's table sat the president, a slender gentleman upon whose countenance wisdom, humor and benignity were evident. A young man—a very young man—whose mien and manner revealed the merciless efficiency inculcated by a course at one of our most technical institutions, was delivering himself of a thesis. In spite of the fact that every member of the audience had a copy of the thesis in his hand, and had been the possessor of a copy for at least a month, the young man insisted on reading every word of it with a terrific intensity. The day was warm.

Concluding his paper, which fairly bristled with calculus, the young author hurriedly called for a blackboard, explaining that researches subsequent to the completion of the paper had developed fascinating addenda. He was evidently fearful lest the venerable president interrupt him by a call for discussion. With

THE OPEN HEARTH

a hand so zealous that he broke the crayon, he diagrammed equation after equation, explaining each one with a flood of *n*th degree mathematics.

The bystander glanced at the 60 or 70 learned engineers in the audience. Some were fanning themselves languidly with their copies of the young man's paper. Others were drearily studying the frescoes. One, painfully, surreptitiously, attempted to sleep.

At length the young man concluded his remarks. The worthy president arose and thanked him for his efforts on behalf of science. He thanked him fervently, almost too fervently, it seemed. And then, with great gentleness and courtesy, he made it plain that no more interminable expositions of arithmetic would be tolerated during the convention. The young scientist left the platform aglow with his consciousness of a great work well done, and the audience smiled.

The president now called for a discussion of the excellent and interesting paper which it had been the society's privilege to enjoy. But there was no discussion.

Counting the Cost

SOME recent statements as to the cost of the European war are almost staggering, showing as they do an accumulation of debts such as the world has never seen. The estimate of the English chancellor of the exchequer, Mr. McKenna, that the cost of the war to England up to March, next, will be ten billion dollars has been supplemented by the statement of Edgar Crammond, the noted English statistician, who says that the direct and indirect cost to the belligerents for the first year of the war was $17,000,000,000 and $50,000,000,000, respectively. The direct daily cost to the various nations at present is estimated as follows: England, $25,000,000; France, $12,500,000; Germany, $22,500,000; Russia, $12,500,000; Austria, $6,250,000.

Emperor William has congratulated the secretary of the imperial treasury upon the success of the third great war loan and a prominent German paper speaks of the success of the loan as carrying a message to the enemy proclaiming that Germany's economic system is able to stand the strain of war and that the nation is by no means down to its last billion. Another paper points out that in 14 months the German nation has placed 26 billion marks at the disposal of the government to be given back in the form of business profits and increased earnings. This paper says that the money remains in the country and, moving in an endless circle, will enable Germany to float still other loans, while the other enemies are obliged to enrich neutral countries.

Sir George Paish, a distinguished authority in England on finances, has issued a statement on the financial strength of Great Britain, in which he refers to the tremendous debt which England had at the close of the Napoleonic wars, £845,000,000, and he says that great as may be the governmental expenditure in this war, the burden of the interest and expenditure will be nothing like as great as that in 1816 and succeeding years in relation to the power of the country to bear it.

It strikes us that both the German and English publicists are straining a point to present the right side of the situation. Of course it is true that Germany is raising its loans in such a way that a large part of the money will be expended in its own territory. It is also true that the wealth of England has increased tremendously in a hundred years, but it is equally true that the burden of debt will hang heavily over all the warring nations for many years to come and help to make many poor people poorer. In nearly a hundred years, from 1816 to 1914, the great debt of England was decreased only £188,000,000, or about $940,000,000. A high financial authority says that the real objections to debt lie against the misuse or waste of funds when it was created. We do not see that this has much to do with the discharge of the debt, for the money is just as hard to pay when the debt is created wisely as when it is due to extravagant expenditure originally. In no way ought these debts to be considered as blessings. They will weigh upon the millions of people for countless years.

Getting Together

ONE of the most significant features of the recent highly successful conventions of the American Foundrymen's Association and the American Institute of Metals, at Atlantic City, was the sentiment in favor of closer co-operation of these two societies and other organizations of American business men. It was also suggested that there should be co-operation with the government wherever possible. Committees appointed by the American Foundrymen's Association to formulate specifications for castings reported progress in co-operation with the American Society for Testing Materials. Progress has also been made in conjunction with the committees of the Institute of Metals and other technical societies, and with the bureau of standards of the United States government. The president of the National Founders' Association was present at the meeting of the American Foundrymen's Association and earnestly invited co-operation with the work of the joint conference board on safety and the training of apprentices.

All things considered, the outlook for obtaining important results through the harmonious action of various societies was never more favorable. The problems to be encountered after the war will be many, and if this country is to have weighty influence in the councils of the nations, it will be a matter of great importance for the business and technical societies of the United States to act as a unit.

Prices Present and Past

Quotations on leading products October 6, average for September, 1915, average for July, 1915, and average for October, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Oct. 6, 1915.	Average for Sept., 1915.	Average for July, 1915.	Average for Oct., 1914.
Bessemer pig iron, Pittsburgh..	$16.95	$16.80	$14.88	$14.85
Basic pig iron, Pittsburgh.....	15.95	15.65	13.83	13.90
No. 2 Fdy. pig iron, Pittsburgh	15.45	15.45	13.60	13.90
Northern No. 2 Fdy., Chgo....	14.25	13.80	13.00	13.50
Lake Superior Charcoal, Chgo..	16.25	15.95	15.55	13.50
Mall., Bess., Chgo.....	15.00	14.20	13.00	13.50
Southern No. 2, Birmingham...	11.50	11.25	9.60	10.00
Southern Ohio No. 2, Ironton..	14.50	14.25	12.60	13.00
Basic, eastern Pa.....	17.25	15.25	13.75	14.00
No. 2X Virginia furnace.....	13.50	13.25	12.50	12.50
No. 2X foundry, Philadelphia..	16.25	16.00	14.50	14.25
Ferro mang., Balti., (prompt)..	115.00	110.00	100.00	68.00
Bessemer billets, Pbgh.....	25.00	24.60	21.40	21.00
Bess. sheet bars, Pbgh...25.00 to	26.00	24.60	21.70	22.00
Op.-h'th sh. bars, Pbgh...26.00 to	26.50	25.80	22.00	22.00
Open-hearth billets, Pbgh.....	26.00	25.60	21.50	21.00
Steel bars, Chgo.....	1.54	1.54	1.46	1.30
Steel bars, Pittsburgh.....	1.40	1.34	1.26	1.20
Iron bars, Philadelphia.....	1.45	1.40	1.25	1.15
Iron bars, Cleveland, local del'y.	1.35	1.35	1.20	1.20
Iron bars, Chgo. mill.....	$1.35	$1.31	$1.20	$1.05
Beams, Chicago	1.54	1.54	1.46	1.30
Beams, Pittsburgh	1.40	1.34	1.26	1.20
Beams, Philadelphia	1.559	1.509	1.359	1.25
Tank plates, Pittsburgh.....	1.40	1.32	1.22	1.185
Tank plates, Chicago.....	1.49	1.49	1.39	1.30
Tank plates, Philadelphia.....	1.40	1.509	1.359	1.25
Sheets, blk., No. 28, Pbgh.....	2.00	1.92	1.77	1.95
Sheets, blue an., No. 10, Pbgh.	1.60	1.52	1.35	1.40
Sh., galv., No. 28, Pbgh.....	3.50	3.67	4.55	2.95
Wire nails, Pittsburgh.....	1.75	1.69	1.59	1.59
Connellsville fur. coke contr....	2.00	1.84	1.67	1.75
Connellsville fdy. coke, contr...	2.40	2.37	2.75	2.35
Heavy melting steel, Pbgh.....	14.00	14.25	11.75	11.44
Heavy melting steel, east'n Pa.	15.00	15.00	12.00	9.75
Heavy melting steel, Chgo.....	11.50	12.00	10.15	9.00
No. 1 wrought eastern Pa.....	16.25	16.00	13.25	11.50
No. 1 wrought, Chgo.....	10.75	10.75	8.90	7.75
Rerolling rails, Chgo.....	13.50	13.15	10.00	10.00
Car wheels, Chgo.....	11.75	11.75	10.30	10.50

(For Additional Prices See Page 718.)

Pig Iron Market in Chicago Active

But Dull in Nearly All Other Centers—Low Phosphorus Advances—High Freights Prevent Exporting

Chicago, Oct. 5.—Pig iron sellers find business excellent. Although August was an unusual month in total tonnage sold and expectations for September business were not large, as it seemed most users must be well supplied, sales during September ran to at least half the August total in the case of more than one seller. October starts with considerable inquiry and constant selling and, based on the experience of last month, should exceed September.

While most of the inquiry and selling is for delivery during first quarter or first half, considerable volume is being taken for delivery before Jan. 1. Inasmuch as stacks now active are well sold up for the remainder of the year, it would seem probably that a greater capacity must be provided during the final quarter.

Although some sellers have held the opinion that present prices should not be advanced, this sentiment is changing and higher prices may be made within a short time. Chicago pig iron is the cheapest relatively in the country and some dealers believe an advance of 50 cents could be made without disturbing the volume of buying. One peculiarity of the present market is that salesmen find they can interest melters who have not inquired and frequently make sales in cases where no inquiry has been put out.

Northern No. 2 foundry is selling at $14.25 for this year and $14.75, Chicago furnace, for first quarter, while malleable is 75 cents higher than these quotations. Just how long these figures will remain depends on continued buying by melters.

Increased premiums for silicon above 3 per cent are being asked and obtained readily, as high silicon iron from southern Ohio and the south have been advanced rapidly and northern silicon thus commands a better price. A sale recently was made to a builder of automobile motors in Michigan of 2,000 tons of 8 per cent silicon from southern Ohio.

Southern iron is not an active factor in Chicago and its immediate vicinity, but competes actively at outlying points where the freight from Chicago overcomes the difference in price. Although some resale southern iron has entered the markeet, it has not been in sufficient tonnage to have an appreciable effect and southern iron is being sold at $12.50, Birmingham, for first half, while some sales have been made at even higher prices. Occasional small tonnages for immediate delivery have been found available at $11.50, Birmingham, but some of this is believed to be resale iron.

Lake Superior charcoal iron remains steady at former quotations, Nos. 1 to 4 selling at $16.25 to $16.75, Chicago.

Freights Very High

New York, Oct. 5.—Advanced ocean freights are proving an effective obstacle to the closing of pig iron tonnages for export to Europe, inquiries for which have been coming in increased number before sellers in this district. At present, $18 to $20 freight is quoted to France and 60s to Genoa, Italy. These rates make sales practically out of the question. Pending inquiries for iron for shipment abroad total from 15,000 to 20,000 tons. New lots asked for include 4,000 tons of low phosphorus, for a country not announced, and 500 tons of foundry for Java. An inquiry for 5,000 tons of bessemer for France has been withdrawn, but that country still is in the market for several tonnages of the same grade. Domestic business has continued quiet the past week. A railroad equipment shop has taken some additional tonnage of special silicons, principally for western plants. A Bridgeport, Conn., valve maker

(*For complete prices see page* 718.)

bought 500 tons of malleable and 300 tons of foundry for early delivery. A Depew, N. Y., consumer who has been figuring on 5,000 to 10,000 tons of basic for first half, has decided not to buy at present. Later developments have shown that the General Electric Co., in closing a week ago against its inquiries totaling 32,600 tons of various grades, did not buy in excess of 10,000 tons and still is negotiating for a round tonnage. Some of the foundry iron purchased will be furnished by a Canadian maker nearby the Buffalo district. A Newark, N. J., pipe maker is inquiring for 1,500 tons of No. 2X and No. 2 plain for first half. Prices show little deviation from recent levels and are strong. There is some talk of further advances by Buffalo makers who have been quoting $15.50, furnace, for No. 2X for first quarter.

Low Phosphorus Goes Up

Philadelphia, Oct. 5.—A further upward swing of standard low phosphorus iron to a new high price level in the present movement featured the week's market in this territory. Sellers here disposed of 8,000 to 10,000 tons of this grade, a considerable part of which went to Canada, and $24, furnace, or $26.52, Philadelphia basis, was obtained in part. This price now is being generally quoted on standard iron for shipment necessarily after Jan. 1, as leading eastern producers are sold up tightly for this year. Some of the iron closed the past week will be delivered into the first quarter, including one lot of 5,000 tons. Prices now being quoted are for immediate acceptance and this inquiry is active. One cause for the present buoyant market in standard low phosphorus is the increased demand from Canada. Since the supply of this grade is limited normally because of the scarcity of ores, prices have been forced up sharply. The market in standard low phosphorus, however, still is considerably below the high mark in history, since tonnages were placed some years ago at $25, furnace, or $27.62, present Philadelphia basis. Lebanon district makers also report a lively inquiry and heavier bookings. These makers have no unsold iron for this year and are quoting $20, furnace, for shipment after Jan. 1.

Outside of the low phosphorus demand, little has been done in the market in this district the past week. A New Jersey steel maker, who has been figuring for several weeks on about 10,000 to 12,000 tons of basic for first half, has taken no action. No other basic lots are active.

Foundry iron still is backward and sales are light. Eastern Pennsylvania prices for this year or first quarter are unchanged. In Virginia the $13.50, furnace, price for No. 2X for this year is disappearing and $13.75 is coming to be regarded as minimum. The Standard Cast Iron Pipe & Foundry Co. has opened its first quarter inquiry for 15,000 tons of No. 3 and forge. It is known to have been quoted $16, eastern Pennsylvania furnace. Pipe makers are not buying much, as their needs are well covered. A lot of 2,000 tons of Virginia forge for early delivery recently was taken at $12.75, furnace, or about $15.50, delivered by barge to a Delaware River pipe foundry. A Williamsport, Pa., buyer is out for 2,000 tons of No. 2X, first quarter. A number of furnaces are resuming in eastern Pennsylvania. The No. 3 Crane and Robesonia are in. No. 10 Hellertown and two Lackawanna Iron & Steel at Lebanon are preparing to follow after months of idleness. The Central Iron & Steel Co. plans to blow in one or two furnaces soon.

Pig Iron Quiet

Pittsburgh, Oct. 5. — Steel-making pig iron grades registered another advance in price last month. According to figures compiled by W. F. Snyder & Co., the average price of bessemer iron in September was $15.906; that for basic iron was $15. Averages are based on sales of 1,000 tons or more, by valley furnaces. Compared with figures established in August, bessemer iron last month advanced $0.842 and basic advanced $0.636. Compared with figures for the corresponding period a year ago, bessemer iron last month advanced $1.906 and basic advanced $2 a ton. In September, 1912, a $17 average was recorded for bessemer iron and basic iron was established at $15.134.

The pig iron market is quiet. No important sales are announced and no large inquiries are pending. Specifications from foundries are increasing in volume.

Yard Stocks Vanishing

Buffalo, Oct. 5.—Furnaces of the Buffalo district during September shipped out an aggregate tonnage in excess of the productive capacity of the going stacks by several thousand tons. In the face of the demand from melters for iron this proportion of outgoing tonnages cannot be maintained for any length of time, as the producers are exhausting their surplus stocks.

Prices on all grades have undergone an additional advance for material to be delivered over the remainder of the year and into first quarter of 1916. The minimum price now on even the low grades is $15.50 at the furnace and the range for the other grades up to high silicon foundry, is covered by a spread of $15.50 to $17. One producing interest has established a minimum of $16 for any grade for delivery over the remainder of the year.

One of the furnace interests in the Buffalo district booked a portion of the 15,000 tons of bessemer iron for export to France, Holland and Italy. Sales generally for the week have been small, owing to the sold up condition of the furnaces. The producers, however, are being flooded with inquiries.

A most noticeable feature of the market is the increasing activity on the part of the melters in the railroad supplies and accessories lines. More of these consumers are coming into the market right along and the aggregate tonnage of their inquiry is large.

Dull But Strong

Cleveland, Oct. 5.—Dullness in the pig iron market is even more pronounced than it was last week, but the shipments on contracts continue heavy and prices are firm. Purchases recently made by the General Electric Co. from Cleveland agencies on its inquiry for a large tonnage were very limited, and it is plain that the company did not purchase a large percentage of the 32,000 tons inquired for.

Sales Are Light

Cincinnati, Oct. 5.—The pig iron market is stationary. Sales and inquiries are light and scattered, especially in what is generally known as the Cincinnati district. Local houses report much better business in the St. Louis, Chicago, Birmingham and Pittsburgh districts. Prices are strong and give no indications of weakening despite lack of orders. Shipments on old contracts are very heavy and are fully equal to production in the south, southern Ohio and Virginia. Buyers and sellers are apparently waiting developments after the first of the year before renewing transactions, the former being well covered for last quarter requirements, and the latter having full order books for the same period. Southern No. 2 foundry resale iron is obtainable at $11.50, Birmingham basis, for prompt delivery. Furnace iron is being held at from $12 to $12.50, Birmingham basis, for the last quarter, and from $12.50 to $13, Birmingham basis, for the first half of next year. Virginia No. 2X is quoted at $14.50, furnace, for the last quarter, and from $14.50 to $15, furnace, for the first half of 1916. Southern Ohio No. 2 foundry is given at $14.50, Ironton basis,

(*For complete prices see page* 718.)

for this year's shipment, and $15, Ironton, for the first six months of next year. Silvery iron is being held at from $18 to $18.50, furnace, for 8 per cent silicon, for either Jackson, O., or Ashland, Ky., makes.

Optimism Prevails

St. Louis, Oct. 5.—The local pig iron situation continues to indicate improvement, and optimism prevails on all sides. Sales last week amounted to something like 5,000 tons, with one order for 2,000 tons of malleable for first half delivery. The remainder was made up of small lots, with the exception of 1,000 tons of northern car wheel iron bought by an Illinois concern, and about 800 tons of southern purchased by a local patent pulley company. Inquiries in the market today include one for 2,000 tons of malleable. Southern iron is quoted at $12.50 for the remainder of the year. Northern iron is held at $14.50, Chicago and Ironton, for this year, and $15 for first half of next year.

Market Deadlocked

Birmingham, Ala., Oct. 5.—Buyers appear cautious and are shying at the stiff prices of the Birmingham pig iron market. While inquiry during the past week has been very good, orders booked by Birmingham district merchant furnaces have been comparatively small. They still are holding prices at $11.50 and $12, for spot delivery, and $12.50 for the first quarter of the new year, for No. 2 foundry.

Orders for both August and September, it is reported, show a decrease under production in the aggregate and therefore stocks are believed to be again growing larger after having been reduced to a little over 100,000 tons in July.

As far as can be ascertained, the market appears to have reached a sort of deadlock. Makers on the one hand claim the situation warrants still higher prices and are boosting the market while buyers seem to have taken a stand that conditions do not warrant the present high market and appear inclined to wait a while longer and see.

Nuts, Bolts and Rivets

Cleveland, Oct. 5.—An advance of about 5 per cent has been made on prices of the larger sizes of carriage bolts and machine bolts. The market is active and manufacturers believe there will be no trouble in maintaining the new discounts. Rivets have also advanced and are quoted at 1.90c on structural and 2c on boiler rivets.

Rivets Quoted at Wide Range in the Pittsburgh Market

Pittsburgh, Oct. 5.—Following an advance in the price of small bolts, manufacturers have advanced prices of large carriage and machine bolts about 5 per cent to meet higher prices of steel bars. Rivet makers are quoting products at a rather wide range, some asking as high as 1.90c for structural rivets, although material is obtainable at 1.70c. Demand for nuts, bolts and rivets is fairly heavy.

Heavy Tonnage of Plates

Represented in Vessels Pending at Atlantic Yards —Several New Contracts Placed

Philadelphia, Oct. 5.—Vessels of a larger type now are figuring in the active ship building market along the Atlantic coast, and pending matters are so numerous that it is stated more tonnage is represented than at any time yet. One estimate in high ship building circles states that 25 vessels of large size, some of them of 15,000 tons gross, are in sight. The Ward line has just placed contracts with the Wm. Cramp & Sons Ship & Engine Building Co. for two freight and passenger vessels of the 12,000 to 15,000-ton type, at a cost of upwards of $2,500,000. In the sum involved, this is one of the largest ship contracts yet placed with eastern yards. The steel required will run 10,000 to 15,000 tons. Deliveries of ships remain far extended, one important yard being filled for two years. In some cases, shipping companies have offered a bonus of $100,000 for delivery in 12 months. Eastern mills will furnish about 1,000 tons of plates for another vessel, placed with Harlan & Hallingsworth, and about 300 tons for two more tanks for the Texas Oil Co., to be built at Quincy, Mass. The Norfolk & Western railroad is inquiring for 18,000 to 20,000 tons of steel, January to March delivery, including 9,000 tons of plates, for the construction of 1,000 90-ton gondolas in its own shops. Bids go in Oct. 14. The demand for plates upon eastern Pennsylvania makers continues very heavy. With one plant, bookings have continued to run 300 per cent of capacity. This maker is sold up well toward the year's close and is quoting 1.45c, Pittsburgh, or 1.619c, Philadelphia, but notwithstanding, a number of consumers are sending in new orders. There is no quoting beyond Jan. 1 at present. The minimum of the plate market now is 1.40c, Pittsburgh, or 1.559c, Philadelphia. A buyer offered 800 tons for last quarter at 1.35c, Pittsburgh, which was declined.

Plates More Active

Pittsburgh, Oct. 5.—The buying movement inaugurated by some of the more important railroad interests is benefiting the market for steel plates and shapes materially. Plates are held at 1.40c for delivery the remainder of this year and some mills are selling at that figure for delivery after Dec. 31. An order for approximately 5,000 tons of plates, shapes and bars for shipment to a foreign nation, not engaged in war, has been taken by a western Pennsylvania mill, at a price above that for domestic delivery. Some mills are unable to promise material in less than six weeks.

Strengthening at Chicago

Chicago, Oct. 5.—Conditions in the market for steel plates are unchanged, 1.59c being asked by eastern mills and 1.54c being quoted by smaller concerns in the west. Universal plates are stronger than sheared, as is usual, $2 per ton difference being observed.

Tonnages for Navy

New York, Oct. 5.—Bids will be taken by the navy department on Oct. 6 for the construction of nine torpedo boat destroyers requiring about 1,000 tons of steel each. For the two battleships to be bid upon Nov. 19, the steel requirements for the hull construction, exclusive of the armor plate, are estimated at 15,000 to 20,000 tons each. Negotiations are being carried on in this city for a number of merchant vessels of the 15,000 tonnage type. Prospects for eastern ship builders continue the best in their history. The Reading railroad has ordered two three-track car floats from a Camden yard.

Conferences have been held at Ottawa this week between the Canadian shell committee and David A. Thomas, representing the British minister of munitions, as the result of which a definite proposal as to what the Canadian manufacturers are prepared to do in the manufacture of heavy guns, will very shortly be forwarded to the British war office. No announcement was made by Mr. Thomas as to further orders for shells.

(*For complete prices see page* 718.)

Demand for Steel Bars

Reflected in Heavy Specifications, Some of Which Are Filed Months Ahead of Time

Cleveland, Oct. 5.—More contracting for the first quarter of next year is being done at 1.40c, Pittsburgh, but as a rule, only the large customers are favored with such contracts. The general tendency of the mills is not to sell to customers more than they have usually bought and to cut down those tonnages wherever possible. Leading automobile manufacturers are in the market for very large tonnages, extending in some cases as far as April, 1917. What policy will be adopted by the mills concerning this business has not been fully developed. Specifying against contracts has been very heavy of late and in some cases tonnage for delivery during the last quarter of the year, as well as third quarter, are already specified. Some interesting questions as to the amount to be paid on these early specifications have arisen, as sales were made usually at $1 higher for fourth quarter than for third quarter.

The Lackawanna Steel Co., through its Cleveland sales office, has closed with the Hydraulic Pressed Steel Co., Cleveland, for the largest single order for shell steel for domestic manufacture yet made. It involves a total of 35,000 tons of 3¼-inch steel in long lengths to be delivered over a period of 16 months, beginning with October. From the starting of the deliveries until July 1, they will be made at the rate of 1,750 tons monthly, but after July 1, the deliveries will be made in gradually increasing tonnages. The steel will be used to forge 5,000,000 steel shell cases. The Cleveland concern is manufacturing these cases under a sub-contract from the Baldwin Locomotive Works.

Heavy Demand for Rounds

New York, Oct. 5.—Inquiries for steel rounds before sellers which still aggregate an enormous tonnage, appear to be chiefly for 6-inch and larger diameter projectiles. Contracts for these larger shells for delivery over various periods next year now are being distributed in this country by representatives of the British, French and Russian governments. The American Locomotive Co. is inquiring for 30,000 tons of 6-inch rounds for forgings for first quarter delivery. The inquiry of the American Brake Shoe & Foundry Co. for 20,000 tons of rounds remains open. A New Jersey manufacturer of mining machinery is credited with buying 7,000 to 9,000 tons additional. A Brooklyn manufacturer of ammunition who inquired for 10,000 tons of 3½-inch is believed to have placed only 1,500 tons to date. A Hudson river implement manufacturer recently asked prices on 10,000 tons of shell steel. A New York house has asked for the steel to cover a contract for 5,000,000 3-inch shells, the order for which it claims to have in hand. This would call for 50,000 to 60,000 tons of steel. An inquiry for 20,000 tons of rounds for France by J. P. Morgan & Co. is believed to have been closed. Another inquiry for 8,000 tons of 8 x 8-inch blooms for France is out. Prices on shell rounds continue at about 2.75c to 3.00c, mill, depending on the tonnage and other conditions. Specifications from the regular bar trade have been heavy the past week. Prices remain at 1.40c, Pittsburgh.

Makers Face Over-Selling

Philadelphia, Oct. 5.—Steel bar producers are facing the problem of avoiding over-selling their output for fixed periods, as recent experience is showing that the customary proportion of cancellations in unspecified quotas cannot be computed upon in the present market. Consumers are taking out their contracts promptly and at maximum tonnages. In this district, the expiration of third quarter contracts Oct. 1 brought a flood of new specifications to makers. In some sales offices the number of these orders was record-breaking. Most makers seem to be avoiding rather than seeking new business at present from the regular trade. While 1.40c, Pittsburgh, is the usual quotation, this remains a purely nominal figure in several cases where the mills are declining practically all business for the present. The Norfolk & Western railroad is inquiring for 2,000 tons of steel bars, 750 tons of iron bars and 6,000 5½ x 10-inch axles for car work to be delivered during the first quarter. Large orders for shell steel are appearing regularly. A new inquiry for 33,000 tons of 3-inch rounds, which is understood to be for Baltimore delivery, is out. A 50,000-ton round contract for export, upon which eastern Pennsylvania makers have been figuring, still is open, as are some other tonnages for this territory. The Bethlehem Steel Co. has divided among several makers 3,500 tons of cold-rolled shafting. Some leading makers of shafting have advanced 2 points to 60 and 55 off.

(*For complete prices see page* 718.)

Deliveries Deferred

Pittsburgh, Oct. 5.—Tremendous demand for steel bars for the manufacture of shrapnel and shells continues. Deliveries are deferred two and three months, in some instances. Domestic consumers are specifying briskly and shipments to shafting, nut, bolt and rivet makers are heavy. Steel bars are firm at 1.40c; some mills are selling at that figure for shipment after Jan. 1. Iron bars are being held at 1.50c by some concerns. Manufacturers of crucible tool steel continue to advance prices rather sharply and now are asking 1.75c per pound, base. Six months ago, this product was offered at 75c per pound.

Anxious to Contract

Buffalo, Oct. 5.—Consumers are offering the mills and agencies of the Buffalo district more or less liberal tonnages over the first quarter of 1916 and a number of users are seeking to cover for their needs over the first half of the following year. The mills crowded to the limit with orders and under heavy pressure on the matter of deliveries, more vital at this time than the question of prices, are limiting contracts booked to first quarter needs. For the most part this business is entered into with established customers only.

Steel Bars Scarce

Chicago, Oct. 5.—Demand for steel bars is stronger than for any other form of finished steel. Buyers seeking tonnage for delivery this year find considerable difficulty in obtaining it, and the market is practically sold out for the remainder of 1915. Some inquiry is being received for requirements during next year, but sellers for the most part are discouraging buyers and comparatively little tonnage is being booked, although some who have insisted on being covered have been given contracts at $1 per ton above present quotations. No prices on steel bars lower than 1.59c, Chicago, are being made.

Bar Iron Improving

Chicago, Oct. 5.—Sales of bar iron are being made more readily as time passes and mills find themselves in increasingly comfortable position. The price remains steady at 1.35c, Chicago mill, without any tendency toward shading, but with a possibility of a higher price as business improves. All producers are operating on better schedule than prevailed a month ago, and some which are unusually well

situated are producing practically capacity tonnage.

Hoops, Bands and Shafting

Pittsburgh, Oct. 5.—Steel hoops have been established at 1.50c and bands at 1.40c. Specifications are heavy and shipments are deferred from six to eight weeks. Cold rolled shafting has been advanced $2 a ton and is now quoted at 60 per cent off the list for carload lots.

More Rail Orders Placed

Business From Leading Systems Coming More Freely—Car Market Actively Increases

New York, Oct. 5.—Rail orders for delivery after Jan. 1 continue to be placed freely. The New York, New Haven & Hartford railroad has bought 15,000 to 20,000 tons, of which 10,000 tons went to the Pennsylvania Steel Co. and the remainder to the Lackawanna and Bethlehem Steel companies. The Baltimore & Ohio railroad has closed for a round tonnage, the exact amount of which has not yet been stated and of this, 11,000 tons went to the Pennsylvania Steel Co. The Southern railway has placed 10,000 tons with the Tennessee Coal, Iron & Railroad Co. and 1,800 tons additional with the Pennsylvania Steel Co. The Boston & Maine is inquiring for 25,000 tons and southwestern lines are negotiating in this city for 15,000 to 20,000 tons more. Of the 10,000 tons recently placed by the Philadelphia & Reading railroad, 5,000 tons went to the Pennsylvania Steel Co.; 3,000 tons to the Bethlehem Steel Co. and 2,000 tons to the Lackawanna Steel Co.

September rail orders were the heaviest of the present year and totaled 325,000, according to statistics compiled by *The Iron Trade Review*. Total rail orders since Jan. 1 reach 1,665,000. The awards by months before September were as follows: August, 160,000; July, 240,000; June, 225,000; May, 140,000; April, 65,000; March, 160,000; February, 150,000; January, 200,000.

Negotiations in the car market continue more numerous. The Michigan Central has bought 500 additional all-steel auto cars from the Haskell & Barker Car Co., doubling a previous order. This increases the recent New York Central system's orders to 4,500. Phelps, Dodge & Co. have ordered 50 ore cars from the Pressed Steel Car Co. The recent order for the Wheeling & Lake Erie, it proves, gave 450 gondolas to the Standard Steel Car Co.; 200 gondolas and 200 steel automobile to the Western Steel Car & Foundry Co.

September car orders totaled about 9,000, making 65,000 during the first nine months. Prior to September, the orders were: August, 3,000; July, 9,500; June, 17,000; May, 18,000; April, 1,150; March, 1,100; February, 4,000; January, 2,600. The betterment in the locomotive market continues.

The Seaboard Air Line is inquiring for 8,000 to 10,000 kegs of spikes for first half. The Norfolk & Western has closed for 3,000 kegs for first quarter. Some leading makers now are holding firmly for 1.60c, Pittsburgh.

Spikes Advanced

Pittsburgh, Oct. 5.—Makers of standard railroad spikes have advanced prices to a minimum of 1.60c for standard sizes. Indications are railroads will cover requirements at an early date. Track bolts are held at 2.25c by some makers. The recent advance in the price of light rails has been established and it is not unlikely that further increases in prices will be announced.

Nickel Plate Rails

Cleveland, Oct. 5.—The Nickel Plate has ordered 5,000 tons of rails for next year's delivery, dividing the tonnage equally between the Carnegie and Lackawanna Steel companies.

Inquiry Increases

Chicago, Oct. 4.—Additional inquiries for railroad cars have been put forth recently, including 650 gondolas and 200 automobile cars for the Wheeling & Lake Erie; 100 box cars for the Minneapolis & St. Louis and 100 hopper cars for the Western Maryland. These inquiries, with others already actively before the market, make a total of new car business much larger than has been entertained for a long while.

The Engineers' Society of Western Pennsylvania will award two medals to the authors of the best and second best papers presented during the year. Papers will be judged on the following points: Value to engineering profession; originality of subject matter, and treatment.

(*For complete prices see page* 718.)

Forging Billets

Command Extremely High Prices—Supply is Limited

Pittsburgh, Oct. 5.—A local consumer recently purchased a small tonnage of forging billets at $31, or $4 below the price at which this product had been nominally quoted. Some of the leading producers of forging billets are refusing to shade $35, Pittsburgh, and as high as $39 a ton has been paid. Specifications for billets and sheet bars continue heavy and prices are hardening. No sales of importance have been made this week in the open market.

High Prices for Billets

Philadelphia, Oct. 4. — Some remarkably high prices for forging billets and blooms are the result of the very lucrative present market for shell manufacture. Makers who have bar mills suitable for rolling these rounds are disposed to conserve for this purpose their marketable tonnages of crude steel unless they can obtain sufficiently attractive prices to warrant the sale of the semi-finished material. On 7,000 tons of forging billets for export, an eastern Pennsylvania maker this week quoted $56, mill. This maker recently sold forging blooms to France at above $45, mill. Similarly high prices are being named by some makers on rerolling billets. Eastern Pennsylvania makers of billets dealing more largely with the regular domestic trade not engaged in making war supplies have been quoting from $28 to $30, mill, for rerolling and $34 to $36, mill, for forging billets, but they are practically out of the market for this year.

Furnace Coke

Is Quiet—Improved Demand for Foundry Grades

Pittsburgh, Oct. 5.—The Connellsville furnace coke market is comparatively quiet. Dealers are asking $2.25, ovens, for shipment the last quarter of the year, but some fuel continues to be offered at $2, ovens, for shipment the next 30 or 40 days. Spot furnace coke is commanding $1.75, ovens. Foundry grades are active and prevailing prices are firm. The *Connellsville Courier* for the week ending Sept. 25, says production was 388,884 tons, an increase of 6,417 tons compared with the week previous.

Furnace Coke Sold

Cincinnati, Oct. 5.—A southern Ohio stack has purchased about 20,000 tons of coke for delivery during the first half of next year. Another southern Ohio stack is inquiring for about 40,000 tons of furnace grades.

Sheet Market

Is Seriously Affected by the Scarcity of Sheet Bars

Youngstown, O., Oct. 5.—Semi-finished steel is usurping the place of spelter in point of interest among valley sheet manufacturers. Not that the spelter situation is less abnormal, but the shortage of semi-finished steel is a problem that will face many sheet producers when they cover for their first quarter requirements. An important feature entering into the steel situation is the growing price distinction between open hearth and bessemer sheets. While no one in this district is selling bessemer black sheets below 2c, Pittsburgh, for No. 28 gage, most makers of open hearth sheets are asking 2.10c, and it is probable this level will be established firmly in the near future. The differential is resulting partly from the shortage of open hearth steel and is partly due to a special demand for sheets of this material. Open hearth sheets have drawing qualities enabling them to be bent and worked which bessemer sheets are said to lack. But for most purposes bessemer sheets are as practical as open hearth, consumers specifying for the latter often as a matter of habit. It is probable the premium asked by the leading interest for open hearth sheets over bessemer is designed to divert as much of the demand as possible to the latter.

Demand for all kinds of sheets has been improving steadily.

Tin Plate Drags

Pittsburgh, Oct. 5.—The market for tin plate continues rather quiet. Some makers are specifying fully, but are stocking material for next year's requirements. No announcement has been made regarding the price of tin plate for the 1916 season; it generally is believed the price will be above that announced at the beginning of the buying movement a year ago.

Reducing Output

Cleveland, Oct. 5.—The scarcity of sheet bars and the high prices demanded for them are affecting the sheet market and the highest prices recently named are firm. The tendency of manufacturers of sheet bars to use their plants to roll large rounds to manufacture shrapnel promises to reduce the output of sheets.

Active at Pittsburgh

Pittsburgh, Oct. 5.—The Westinghouse Electric & Mfg. Co., the General Electric Co. and other builders of motors are specifying briskly for steel sheet products. Shipments last month showed a substantial increase over those of August. Black sheets are firm at 2c for No. 28 gage and blue annealed sheets are held at 1.60c for No. 10 gage. Galvanized sheets continue irregular; they are selling at 3.50c for No. 28 gage, but demand is light. The substitution of painted sheets for galvanized sheets has affected the market for galvanized material to a considerable extent.

Firm at Cincinnati

Cincinnati, Oct. 5.—The sheet market is firm. Mills are still refusing to quote for extended delivery, and prompt business during the past week has shown an improvement. Black sheets No. 28 gage are given at 2c, and galvanized sheets No. 28 gage at from 3.75c to 4c, all Pittsburgh basis. Warehouse prices are as follows, Cincinnati basis: Black No. 28 gage, 2.45c to 2.55c; galvanized No. 28 gage, 4.50c to 5c; blue annealed No. 10, 2c.

Show Strength

Chicago, Oct. 5.—As the supply of lower priced sheet bars is becoming exhausted and makers of steel sheets are faced by the necessity of replenishing their supply at present prices, considerable strength is developed in the sheet market, especially as demand is excellent.

No. 28 gage black sheets are quoted at 2.19c, Chicago mill, for last quarter and 2.29c, Chicago mill, for first quarter. These prices are likely to be increased at any time under present circumstances. Blue annealed No. 10 gage are quoted at 1.79c, Chicago mill. Galvanized sheets continue to be an uncertainty with the leading independent steel maker out of the market, but eastern sellers are quoting 3.79c, Chicago mill.

Ferro Shipments

Being Made More Freely, But Uncertainty Still Prevails

New York, Oct. 5.—Several thousand tons of English ferro-manganese now are promised for October delivery which will be the largest in any similar period for three or four months past or since renewed restrictions on shipments were imposed by the British government. The ANNAPOLIS, now en route, is carrying considerable quantities for at least two sellers, these aggregating 1,500 to 2,000 tons. Another maker, as stated previously, is arranging to resume shipments this month with an initial lot of about 500 tons. A fourth seller, who has been bringing in occasional moderate lots, also will import a fair tonnage. Another arrival of 300 tons at Philadelphia was reported this week. Recently, a similar tonnage not heretofore referred to, was received at Baltimore.

These increased shipments in sight tend to improve the situation considerably, but it still is pointed out that even the augmented October shipments will be much less than the present monthly consumption of the country. On the other hand, there is no evidence of any interruption of works operations as result of ferro-manganese shortages. The situation seems to be that domestic production and occasional lots of English offered are sufficient to meet any present urgent demand which is not covered by stocks in buyers' hands. If very early delivery is necessary, premiums must be paid. An eastern Pennsylvania buyer placed 250 tons of spot October and November and paid $105, seaboard, at least, for the spot. It is believed domestic metal was furnished. On a carload for November, a domestic maker quoted $120, furnace. Occasional sales of carloads command $110 to $115, seaboard, while $125 to $130, seaboard, has been paid for small lots. Some buying of English and domestic for future delivery continues usually at $100, seaboard, with the seller in the former case making no positive guarantee of delivery. Some of these sales have specified December shipment. An eastern Pennsylvania steel maker bought 600 tons for future delivery, a Kentucky steel works 100 tons and a northern Ohio consumer 600 tons.

An interesting aspect of the situation has been the sale of some domestic ferro-manganese for export through New York agents. The destination is not given, but it is believed to have been in Europe, where recent inquiries have emanated. One of these for 500 tons, it will be recalled, came even from the British Isles, and it was thought this was for re-export. Sweden and other countries have been recent inquirers.

Ferro-Alloys Scarce

Pittsburgh, Oct. 5.—Dealers continue to offer English ferro-manganese for future delivery at $100, seaboard, although higher prices are being quoted for prompt shipment. Demand for 50 per cent ferro-silicon continues heavy, but prices have not been advanced. Lower grades of bessemer ferro-silicon were advanced 50 cents a ton last week. Quotations for ferro-molybdenum, ferro-tungsten and ferro-vanadium are considered nominal. Supplies are described as decidedly small.

The Milwaukee Auto Engine & Supply Co., Milwaukee, Wis., has increased its capital stock from $6,000 to $30,000.

(For complete prices see page 718.)

Tonnage of Shapes

For Elevated Work Very Large—Outlook for Fabricators Improved

New York, Oct. 6.—Inquiries have been issued by the New York Municipal Railways Co. for bids Oct. 9 on practically 60,000 tons of fabricated steel for third-tracking of present elevated roads and the construction of new lines in Brooklyn. Included in this budget is the Coney Island terminal, which will require from 15,000 to 16,000 tons. The 60,000 tons now in the market represents only a portion of the steel requirements which remain to be placed to complete the new tri-borough rapid transit system in the metropolis. Fabricated steel conditions are more promising. A notable feature is the offering of increased tonnages by the eastern railroads. About 10,000 tons of bridge work now are in the market for four or five lines. New work out for figures in New York City is not so plentiful at the moment, but a heavy volume is reported in the estimating stage. Plain material prices are firm at 1.40c to 1.45c, Pittsburgh, or 1.569c to 1.619c, New York, depending upon the tonnage and the delivery.

Active at Pittsburgh

Pittsburgh, Oct. 5.—Specifications for structural shapes are heavy, and consumers show a disposition to buy for first quarter requirements. Material is being held at 1.40c for this year's delivery and some mills are accepting contracts for shipment the first quarter at that price. Sales managers are scrutinizing inquiries more carefully, and are reducing tonnages in a great many instances, to prevent speculation.

Chicago Contracts

Cleveland, Oct. 5.—A new Tod House, Youngstown, will require about 600 tons. Bids are being received by J. C. Spencer, consulting engineer, 242 Rockefeller building, Cleveland. It is expected that the award will soon be made. Know & Elliott are the architects. The contract for the steel for the Hollenden addition will also be soon awarded.

Tonnage for Hotels

Chicago, Oct. 5.—Fabricating concerns are booking considerable tonnages and are calling on mills for their supply of shapes. Although prices have been advanced to 1.59c, Chicago, some large interests are quoting $1 per ton lower on business for immediate specification when these are unusually attractive.

Among structural projects closed the past week are three on the Pacific coast involving approximately 1,500 tons, which will be fabricated by Dyer Brothers at Seattle. It is understood this material will be fabricated from shapes imported from Chinese or Indian rolling mills, competition being such that this steel is obtainable at considerably lower prices than it can be furnished by makers in this country.

Heavy Tonnages in East

Philadelphia, Oct. 5. — Plans were issued the past week for bids Oct. 19 on 25,000 to 27,000 tons of structural steel for the new Frankfort elevated railroad line, this city. The Norfolk & Western railroad is inquiring for 6,000 tons of shapes for car construction. Operations of eastern Pennsylvania shape mills continue on a record-breaking scale. Shipments in September with some of these plants were the heaviest in history and October is expected to surpass this record. Specifications against expiring third quarter contracts the past week were large. Prices are very strong. Buyers appear willing to pay higher prices for early shipment and where the mills can arrange to supply these needs from present selling schedules, they are receiving 1.50c, Pittsburgh, or 1.659c, Philadelphia. A lot of about 175 of 18-inch beams was booked in the week at this figure. Smaller pick-ups also command this price, and from mill stocks 1.60c, Pittsburgh, remains the schedule. The 1.40c, Pittsburgh, price is applied on larger lots for forward delivery and only some mills will accept it.

CONTRACTS AWARDED.

Fifteenth avenue bridge over Lake Washington canal, Seattle, Wash., 1,215 tons, to Dyer Brothers.

George Benz & Sons, building, St. Paul, Minn., 965 tons, to St. Paul Foundry Co.

Coal loading out plant for Southern Stevedoring Co., Baltimore, 810 tons, to American Bridge Co.

Dentistry building for University of Iowa, Iowa City, Ia., 417 tons, to Iowa City Iron Works.

Chicago & Milwaukee Electric Railway bridge near Milwaukee, 225 tons, to Wisconsin Bridge & Iron Co.

State of Washington, buildings for school for feeble minded, Medical Lake, Wash., 175 tons, to Dyer Brothers.

Schuyler square apartment, Schuyler square, New York City, 800 tons, to the Passaic Structural Steel Co.

Emerald street bridge, Philadelphia, for city of Philadelphia and Reading railroad, 500 tons, to the American Bridge Co.

Machine shop for the E. W. Bliss Co., Brooklyn, 900 tons, to the Hedden Iron Construction Co.

Eastman Kodak Co., Rochester, two new factory additions, 450 tons to American Bridge Co.

Statler Hotel, Detroit, large addition, 800 tons to American Bridge Co.

Broken Hill Proprietary Co., New Castle, Australia, 2,000 tons of structural material for plant extensions, awarded the Riter-Conley Mfg. Co., which furnished steel for the erection of the main mill buildings.

Rebuilding Chicago Street Viaduct, Buffalo, 2,200 tons structural, 500 pig iron, contract to Stroebel Steel Construction Co., Chicago.

Extension to open-hearth steel plant of the Youngstown Sheet & Tube Co., Youngstown, 3,500 tons, awarded the American Bridge Co.

Aluminum Ore Co., East St. Louis, Ill., 1,000 tons for extensions, awarded the American Bridge Co.

CONTRACTS PENDING.

Extension of elevated lines in Brooklyn for the New York Municipal Railways Co., 60,000 tons bids to be taken Oct. 9. Work represents third tracking of Fulton street line, building of new Jamaica avenue line, construction of Coney island terminal, etc.

Frankfort elevated railroad line, Philadelphia, 25,000 tons, bids to be taken Oct. 19.

Four bridges for Central Railroad of New Jersey between Jersey City and Elizabeth, 1,200 tons, bids being taken.

Bridge work for the Long Island railroad, 2,000 to 3,000 tons, bids being taken.

Pier at Thirty-fifth street, Brooklyn, 1,500 tons, bids being taken. Post & McCord low bidder, which means fabrication will go to the American Bridge Co.

Appraisal stores for the government, Boston, 2,000 to 2,500 tons, bids to be taken Oct. 9.

Apartment house for Bing & Bing, East Forty-fourth street, New York City, 600 tons, bids being taken.

Apartment house for the A. L. L. Construction Co., 162-168 West Eighty-sixth street, New York City, plans being prepared.

Bridge work for the Charleston & Southern railway, 3,000 tons; bids being taken.

Bridge for the Philadelphia & Reading railroad at Sunbury, Pa., 3,000 to 3,500 tons; Pennsylvania Steel Co. low bidder among independent shops.

(*For complete prices see page* 718.)

Wire Makers Busy

Pittsburgh, Oct. 5.—Manufacturers of wire products in the Greater Pittsburgh district literally are swamped with orders. Most makers have enough tonnage on their books to assure activity until March 1, next. Unspecified contracts are being cancelled, and practically no new business is solicited. Activity has been augmented, of course, by demand for barb wire for shipment to belligerent European nations, but the domestic trade has been improving rapidly the last 30 days. Some mills are asking $1.80 a keg for nails, although the 1.75c figure nominally is quoted by most concerns.

Much Higher Prices

Cleveland, Oct. 5.—The wire market is extremely active and galvanized fence wire is being quoted at 2.55c, an advance of $4 per ton over quotations recently prevailing. Prices on bolt wire are also high and the general wire situation is strong.

The semi-annual meeting of the American Railway Association will be held at the Blackstone hotel, Chicago, November 18.

Scrap Market

Is Quiet and Prices on Some Grades Show Signs of Weakness

Philadelphia, Oct. 4.—With the larger buyers well covered on their needs for sometime as the result of recent heavy purchases, the old material market in this territory continues to rule quieter and reactionary tendencies are being experienced. Brokers are the chief buyers, as they are covering on a large tonnage of recent orders. They will take thousands of tons of heavy melting steel at $14.50, delivered eastern Pennsylvania, and have been paying up to $14.75, delivered. Consumers of steel are not anxious to buy at $15, delivered, and it requires something attractive to induce them to pay this figure. No. 1 railroad wrought is easier and buyers have obtained some lots at $16, delivered. Turnings also are weaker, with sales at $10.25, delivered. Shafting has sold lower at $18.50, delivered. Wrought pipe is dull and soft with the leading buyer out of the market. One leading buyer of cast scrap in this territory is in the market for several thousand tons and is offering $14, delivered, for No. 1 heavy. Open offers of $14.50, delivered, for No. 1 forge are current.

Foundry Grades Stronger

New York, Oct. 5.—Foundry grades of scrap are stronger than mill material for the moment and the general market condition continues one of irregularity. For No. 1 heavy cast up to $13.25, delivered New Jersey points, has been paid; for stove plate $11, delivered in the same district, has been offered. Heavy melting steel is easier and $15, delivered eastern Pennsylvania, now can be obtained from the consumers only in special cases. Usually sellers, if they are obliged to move metal, must take less. Some of the steel companies offer only $10, delivered eastern Pennsylvania, for turnings.

Old Material Quiet

Pittsburgh, Oct. 5.—Iron and steel scrap dealers have experienced a lull the last 20 days. Heavy melting steel, which commanded $15 a ton a month ago, has been sold at $14 a ton recently. Prices of other grades are firm, but demand is light. The present lull appears to be the natural result of an abnormally heavy buying movement in August.

Heavy Shipments

Buffalo, Oct. 5.—Yards of the Buffalo district report shipments being made in good volume. The demand for machine shop turnings continues, but the excess production of this line over consumption has caused the price to soften 50c from the schedule quoted a week ago. The scarcity of old steel axles and the demand for old car wheels have caused the former to advance 50c and the latter 25c over previous schedules.

Mills Congested

Cleveland, Oct. 6.—Shipments of iron and steel scrap have been so heavy as a result of recent buying, that mills are becoming congested with material, which is having a slightly depressing effect upon the market. Some brokers are predicting weakness in heavy steel prices, but at present the market for this description is firm at $12.75 to $13, gross ton, Cleveland. Stocks which have been held for months or years, pending the return of normal conditions in the iron and steel trade, are coming out of yards in great volume, which may account for the present heavy shipments to consumers. Other quotations are unchanged.

Stationary at Cincinnati

Cincinnati, Oct. 5.—The scrap market is stationary. Shipments on old contracts to rolling mills are very heavy and constitute the only activity in the market. Although jobbing foundries are busy, they are not buying much scrap iron.

Chicago Market Quiet

Chicago, Oct. 5.—Buyers and sellers of iron and steel scrap in the Chicago district are resting on their arms and little trading is being done. Three railroad lists are active at present, the Santa Fe offering 2,300 tons, the Wabash 1,500 tons and the Baltimore & Ohio 12,000 tons. The latter list includes 3,000 tons of long steel rails, 500 tons of car wheels, 700 tons of No. 1 cast and 900 tons of No. 1 wrought.

Prices Maintained.

St. Louis, Oct. 5.—The tone of the scrap market was very steady all of last week, and prices were maintained fairly well in spite of very light buying by consumers. The railroad offerings are: Frisco, 100 tons uncut fireboxes; Missouri Pacific, 810 tons; Baltimore & Ohio, 12,000 tons, of which 3,000 tons are long length steel rails and 1,000 tons cut steel car frames; also an open list from the New York Central.

The American Cast Iron Pipe Co. has been given 345 tons at Middletown, O., and the United States Cast Iron Pipe & Foundry Co. has taken 52 tons of 15-inch pipe for St. Louis.

(*For complete prices see page* 718.)

Ore Shipments

Were Heavy in September, Largest in History of the Lakes

Ore shipments during September were 7,863,146 tons, bringing the total movement to Oct. 1 up to 34,669,566 tons. While the September movement was not as large as was expected, it is nevertheless the largest September movement in the history of the trade, exceeding the movement of September, 1912, by 575,916 tons, when 7,287,230 tons were moved.

Following are the shipments by ports:

Port.	Sept., 1915.	Sept., 1914.
Escanaba	1,015,820	553,959
Marquette	539,879	335,928
Ashland	1,028,363	662,141
Superior	1,557,935	1,901,422
Duluth	2,428,689	1,126,532
Two Harbors	1,292,460	851,325
	7,863,146	5,431,307
1915 increase	2,431,839	.....
Port.	To Oct. 1, 1915.	To Oct. 1, 1914.
Escanaba	4,011,682	3,019,651
Marquette	2,313,532	1,385,718
Ashland	3,829,582	2,741,917
Superior	5,997,023	9,476,253
Duluth	11,807,219	5,278,899
Two Harbors	6,710,528	4,804,975
	34,669,566	26,709,413
1915 increase	7,960,153	.....

Cast Iron Pipe

Market is Quiet, But Prices Are Being Well Maintained

New York, Oct. 5.—Cast iron pipe trade is quiet in the eastern district, but it is of practically normal proportions for this time of the year. Prices are steady. Water and gas companies still are feeling out the foundries on tonnages for next year's shipment, but have not yet brought themselves to the point of paying the advances without which makers will not accept contracts. Export inquiries still are quite numerous but are materializing slowly. The department of water supply, gas and electricity of this city will take bids Oct. 7 on 400 tons of 6's to 12's, which is a contractor's letting. Sydney, S. C., is closing this week on 350 tons of 4's and 6's. Galveston, Tex., will take bids Oct. 7 on 600 tons of 30's.

Slow at Chicago

Chicago, Oct. 5.—Slack conditions in the market for cast iron pipe continue. Cities have not yet begun to inquire for their supplies for next year and comparatively little tonnage is being taken for this year's operations, as the imminence of frost prevents much activity.

Dinkey Resigns

(*Continued from Page 665.*)

laboratory of the Cambria Iron Co., as a carbon boy. Five years later, Mr. Williams left the company to take a special course in chemistry and metallurgy at Lehigh University, where he remained three terms. For a brief period, he was a chemist at the Joliet Works of the Illinois Steel Co., at Joliet, Ill., and for two years was chief chemist at the Colby mine, Bessemer, Mich. Mr. Williams was identified for five years with the Colorado Fuel & Iron Co., as night superintendent of the bessemer department and rail mill. During 1897-1899, he was connected with the Maryland Steel Co., at Sparrows Point, Md., leaving that concern to take charge of the bessemer department of the Homestead Steel Works of the Carnegie company. In 1903, when Mr. Dinkey was elected president of the Carnegie Co., Mr. Williams was appointed assistant general superintendent of the Homestead plant. A year later, he was appointed general superintendent of the Duquesne Steel Works, at Duquesne, Pa., one of the most modern plants in the Corporation.

Mr. Williams is president of the Duquesne Trust Co., and is a director of the Monongahela Trust Co. He is a member of the Duquesne Club of Pittsburgh, the University Club of Pittsburgh, the German Club, the Country Club and the Athletic Association of Pittsburgh.

Judge Gary's Tribute

Chairman E. H. Gary, of the Steel Corporation, in announcing the resignation of Mr. Dinkey, said:

"We are very sorry to part with him. He is one of the ablest all-round steel men in this country and he has rendered effective and satisfactory service to the Carnegie company.

"He will receive from the Midvale company greater compensation than we could afford to pay. He has our confidence, friendship and best wishes for continued success. The rearrangement of the organization in the Carnegie Steel Co. will probably be decided upon and announced within a very short time."

Leaves Pittsburgh

Pittsburgh, Oct. 6. (By wire.)—Mr. Dinkey left Pittsburgh last night for Philadelphia to take immediate charge of the Midvale Steel & Ordnance Co. He made no annquncement relative to rumors concerning the merger of the Midvale company and other steel concerns. Homer D. Williams, Mr. Dinkey's successor and new president of the Carnegie company, will become the active head of that interest upon his return from New York.

Hamilton Promoted

New York, Oct. 6. (By wire.)—Edward Hamilton, who was assistant superintendent of the Duquesne works of the Carnegie Steel Co., has been made superintendent, succeeding Homer D. Williams, just made presidetn of the Carnegie Steel Co.

New Company Incorporated

New York, Oct. 6. (By wire.)—The Midvale Steel & Ordnance Co. was incorporated at Dover yesterday, with a capital of $100,000,000 to take over the Midvale Steel Co. and probably to form the neuclus of a munition plant merger. The Midvale Steel Co. had a capital of $9,750,000.

Conference in New York

New York, Oct. 5.—A conference was held at the Bethlehem Steel Co.'s offices here today, which was attended by Mr. Schwab, E. T. Stotesbury, director of the Pennsylvania Steel Co. and prominent in the affairs of the company, and by other persons closely identified with the Pennsylvania Steel Co. Following the conference, Mr. Schwab confined any statement to the remark: "The deal has not been closed."

It is denied that Mr. Schwab's present negotiations include any attempt at control of the Cambria Steel Co.

Schwab After Pennsylvania

New York, Oct. 5.—A new angle of the many rumors of steel works and war plant combinations which still fill the air in the east, was the development within the week of further circumstances which tend to indicate that Chas. M. Schwab and associates have been negotiating for the control of the Pennsylvania Steel Co. It is known that Mr. Schwab has held conferences at Philadelphia within the past 10 days with high officials of the Pennsylvania Steel Co. Some reports are afloat which purport to give the terms at which the stock of the Pennsylvania Steel Co. will be taken over, but these are unsupported by official statements from any of the executives who would be identified with such a transaction. One report is current that the option on the majority stock holdings of the Pennsylvania railroad in the Pennsylvania Steel Co., which was given some time ago to W. H. Donner and associates, has been, or is to be, transferred to Mr. Schwab. If this be true, it is accepted as finally disposing of the negotiations toward the amalgamation of the Pennsylvania and Cambria Steel companies.

If Mr. Schwab and associates acquire the Pennsylvania Steel Co., it is believed that their main purpose in doing so is to obtain a tidewater steel works and another modern shipbuilding plant such as the Maryland Steel Co. at Sparrows Point, which is a subsidiary of the Pennsylvania Steel Co. The enormous iron ore holdings of the Pennsylvania Steel Co. in Cuba, it also is believed, will be an important asset to the Bethlehem Steel Corporation.

Pig Iron Output

(*Continued from Page 664.*)

were: North Birmingham No. 4, Sloss-Sheffield Steel & Iron Co., Sept. 2; Bessemer No. 2, Tennessee Coal, Iron & Railroad Co., Sept. 8; one Vanderbilt, Woodward Iron Co.; Iroquois "D", Iroquois Iron Co., Sept. 7; Norton, Norton Iron Works, Sept. 11; Standish, Northern Iron Co.; Ironton, Sept. 14, Lawrence, Sept. 11, Marting Iron & Steel Co.; Crane No. 2, Empire Steel & Iron Co., Sept. 29; Claire, M. A. Hanna & Co.; Alice, Valley Mold & Iron Co., Sept. 30; Crozer, Virginia Iron, Coal & Coke Co., Sept. 30; Thomas, Thomas Furnace Co., Sept. 5. Colebrook No. 2, Lackawanna Iron & Steel Co., blew out Sept. 1.

The steel works furnaces blown in were: South Chicago No. 2, Wisconsin Steel Co., Sept. 4; La Belle No. 1, La Belle Iron Works, Sept. 27; one Bethlehem, Bethlehem Steel Co.; one Isabella, Sept. 7, and one Farrell, Sept. 7, Carnegie Steel Co.; one Steelton, Pennsylvania Steel Co.; Hall, Republic Iron & Steel Co., Sept. 8; Swede No. 1, Alan Wood Iron & Steel Co., Sept. 24. One Minnequa, Colorado Fuel & Iron Co., was relighted Sept. 25 and one blown out on the same day.

Dunbar No. 2 of the American Manganese Mfg. Co., Dunbar, Pa., is being relined. No. 1 furnace is operating on 80 per cent ferro-manganese.

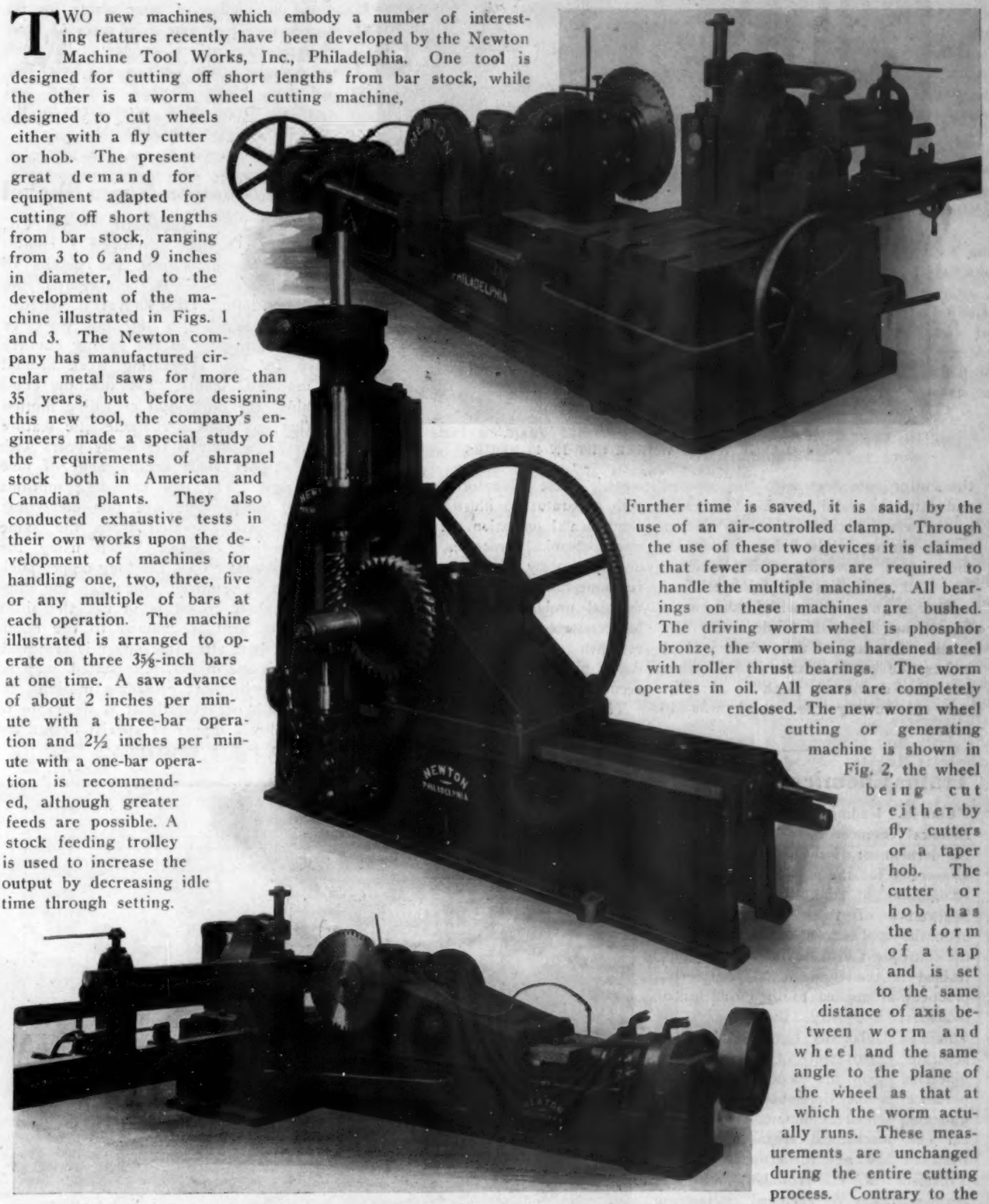
Big Order Reported

The Driggs-Seabury Ordnance Co., Sharon, Pa., is reported to have received an $8,000,000 order for shrapnel, which will require 30,000 tons of steel. The order, it is stated, was placed by representatives of entente nations in New York.

Cutting Tools for Bars and Wheels

New Circular Saw Cuts Several Shrapnel Bars at Single Operation—
Worm Wheel Cutter Employs Either Fly or Taper Hob

TWO new machines, which embody a number of interesting features recently have been developed by the Newton Machine Tool Works, Inc., Philadelphia. One tool is designed for cutting off short lengths from bar stock, while the other is a worm wheel cutting machine, designed to cut wheels either with a fly cutter or hob. The present great demand for equipment adapted for cutting off short lengths from bar stock, ranging from 3 to 6 and 9 inches in diameter, led to the development of the machine illustrated in Figs. 1 and 3. The Newton company has manufactured circular metal saws for more than 35 years, but before designing this new tool, the company's engineers made a special study of the requirements of shrapnel stock both in American and Canadian plants. They also conducted exhaustive tests in their own works upon the development of machines for handling one, two, three, five or any multiple of bars at each operation. The machine illustrated is arranged to operate on three 3⅝-inch bars at one time. A saw advance of about 2 inches per minute with a three-bar operation and 2½ inches per minute with a one-bar operation is recommended, although greater feeds are possible. A stock feeding trolley is used to increase the output by decreasing idle time through setting.



FIGS. 1 AND 3—MACHINE FOR CUTTING OFF SHORT LENGTHS OF BARS
FIG. 2—NEW WORM WHEEL CUTTING MACHINE

Further time is saved, it is said, by the use of an air-controlled clamp. Through the use of these two devices it is claimed that fewer operators are required to handle the multiple machines. All bearings on these machines are bushed. The driving worm wheel is phosphor bronze, the worm being hardened steel with roller thrust bearings. The worm operates in oil. All gears are completely enclosed. The new worm wheel cutting or generating machine is shown in Fig. 2, the wheel being cut either by fly cutters or a taper hob. The cutter or hob has the form of a tap and is set to the same distance of axis between worm and wheel and the same angle to the plane of the wheel as that at which the worm actually runs. These measurements are unchanged during the entire cutting process. Contrary to the general practice of gradually cutting the teeth of

the wheel deeper by feeding the cutter in a radial direction to the wheel center, the cutter in this process is fed on a tangent to the circumference of the wheel. By this arrangement,

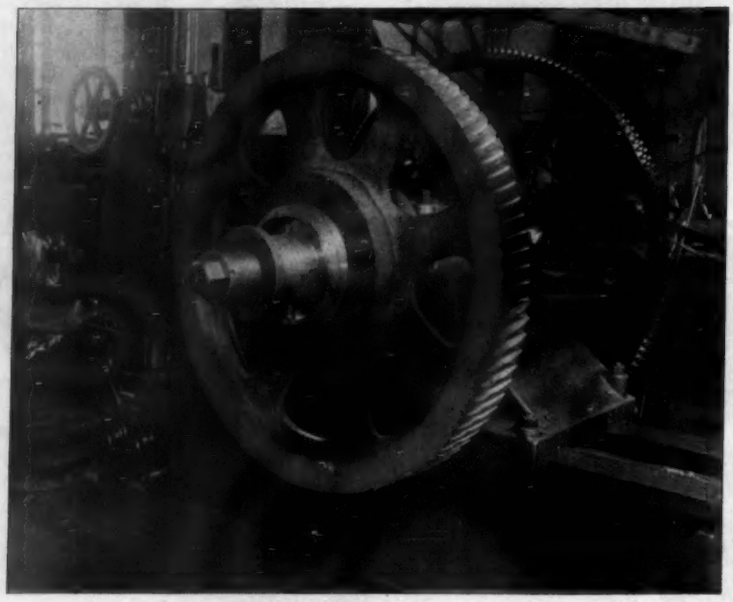


FIG. 4—LARGE WORM WHEEL CUT IN 10 HOURS

the cutter cuts first with the tapered end into the solid metal. The teeth of the wheel become gradually deeper as the cutter, while being fed across the surface, grows larger in diameter. The full end finishes the teeth.

The large worm wheel shown in Fig. 4, has 92 teeth, triple lead. The outside diameter of this wheel is 47½ inches, the width of face is 5½ inches and the diametral pitch is 2. The time of cutting the wheel was 10 hours.

Trains Chemical Engineers

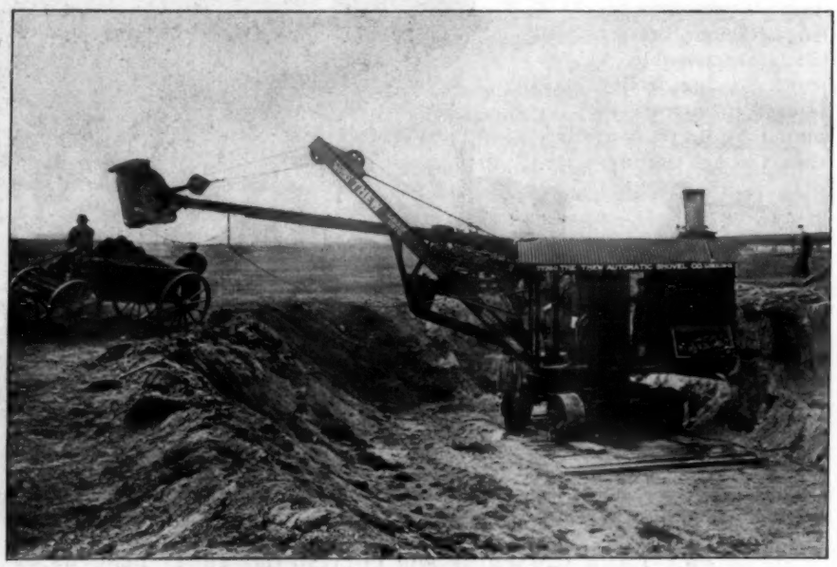
Courses leading to the degree of chemical engineer have been offered in the department of chemistry of Columbia University for the past ten years but, in recognition of the rapidly increasing importance of those industries based upon the applications of chemistry, and the consequent demand for men specially trained in the fundamental engineering practices as applied to the problems of industrial chemistry, the trustees of Columbia University have established a separate department of chemical engineering upon the same plane of importance in the Columbia graduate engineering school as mining, civil, electrical and mechanical engineering. The head of the new department will be Professor M. C. Whitaker, who has been professor of chemical engineering at Columbia University for the past five years. The chemical engineering laboratories which were recently installed, where the students are taught to use engineering methods and engineering appliances in the study and development of chemical industry, have been recently provided with still further equipment. These laboratories are equipped with apparatus to illustrate the various fundamental operations of chemical and electro-chemical processes, and the student learns by actual contact to apply fundamental scientific principles to industrial problems. Here research may be conducted on such a scale as to establish the dependable engineering data necessary for intelligent and accurate process design.

The sudden demand for products previously secured from Europe has greatly stimulated activity among chemical manufacturers. In many cases it is necessary first to develop the raw material supplies, as for example for the manufacture of coal tar dyes, where large quantities of benzol, phenol, toluol, etc., are required.

The constantly increasing demand for these materials is being met rapidly by the installation of large plants for the recovery from coke oven gases of these heretofore waste products, by such concerns as the Lackawanna Steel Co., United States Steel Corporation and other large coke producers in the United States and Canada.

Combination Boom Shovel

The Thew Automatic Shovel Co., Lorain, O., has developed a combination boom shovel, the details of which are shown in the accompanying illustration. This shovel is particularly suitable for ditching work or light stripping in the mining country or for any excavating work around industrial plants. The machine combines the horizontal crowding motion that has been a characteristic feature of Thew shovels for many years with a shipper shaft arrangement of new design. The two crowding motions are independent and non-interfering. Both are operated from the same crowding engine. When using the horizontal crowd, the long dipper stick must be removed, and when the shipper shaft crowd is in use the short dipper arm is chained to the boom structure, after the dipper is removed. The same dipper, it is stated, may be used with both crowding motions, although occasionally it is desirable to employ a dipper of special design for deep trench excavation.



AUTOMATIC SHOVEL WITH CROWDING MOTION AND SHIPPER SHAFT MECHANISM

Progress in Machine Shop Methods

A Summary of the Advance in Equipment and Processes With Particular Reference to Special Alloy Steels and Machining With Edge Tools

BY E. R. NORRIS

MANY important developments in machine shop equipment and practice have occurred recently, and while it is possible to collect and review only a few of these in this article, the few examples presented may be considered as fairly representative of the progress, and may, in a measure, indicate the present trend of development.

It is about 14 years since Taylor and White discovered the special treatment which gave to the world high-speed steel, and while it was early predicted that the use of this steel would revolutionize machine tool equipment and methods of manufacture, it naturally took some time for machine tool builders and users to fully realize the changes which had to be made in equipment and methods, in order that the demands of the new steel might be met in an efficient manner. The greatly increased feeds, speeds and depths of cut, which were made possible by the use of the new steel, rendered it necessary for the builders of machine tools to redesign their tools along heavier lines, with greater pulling power, and later to equip the machines with quick changing and automatic or semi-automatic attachments to facilitate the handling of the work between cuts. The larger manufacturer had to be particularly careful in adopting high-speed steel when it was first introduced, his equipment not being suitable for its economical use; also, having a large stock of carbon and mushet steel tools, it was reasoned, and rightly so, that the change to high-speed steel must be made gradually. The new steels also made it possible for the machine operators to increase their productive capacity without an equivalent effort on their part, and it naturally followed that time and money values on work had to be adjusted to meet the new condition. Shops working under the premium plan of payment, or similar systems having a sliding scale of pay depending on the time taken to perform work, were in a position to adopt the new steel in many cases before values were adjusted to meet the new conditions. Under piece work or similar systems of payment, however, it was absolutely necessary to promptly adjust the price paid, in line with the savings in time made with the new steel, and there is no doubt that this fact, in a great many cases, retarded considerably the general adoption of the steel.

During the period between 1898 and 1900, Taylor and White discovered and developed the process of treating tools made from chromium-tungsten steels; and while shortly after this time it was generally known that steel of this kind heated nearly to the melting point would do considerably more work, comparatively few took full advantage of the steel until Mr. Taylor's paper "On the Art of Cutting Metals" was published in 1906. This paper created a profound and world-wide interest in steel; and while the paper dealt only with the results obtained with forged cutting-edged tools of lathe and planer types, its value was well known, and the new steel was rapidly substituted for the steels which were being used for drills, milling machine cutters and other kinds of cutting-edged tools.

Before entering into a detailed discussion of these matters, it may be well to state that for convenience the subject matter has been arranged in four groups, which will be taken in the following order:

Special alloy steels and stellite;
Machining with edge tools;
Grinding;
Electric driving for machine tools.

Shortly after the publication of the paper "On the Art of Cutting Metals", many steel manufacturers became highly interested in the subject, and, as a result, many varieties of the tungsten-chromium steels were rapidly placed upon the market by both home and foreign producers. The so-called "air hardening" steel, introduced by Robert Mushet about the year 1870, contained the essential elements of a high-speed tool steel, and required only the special treatment discovered by Taylor and White to improve the high speed cutting quali-

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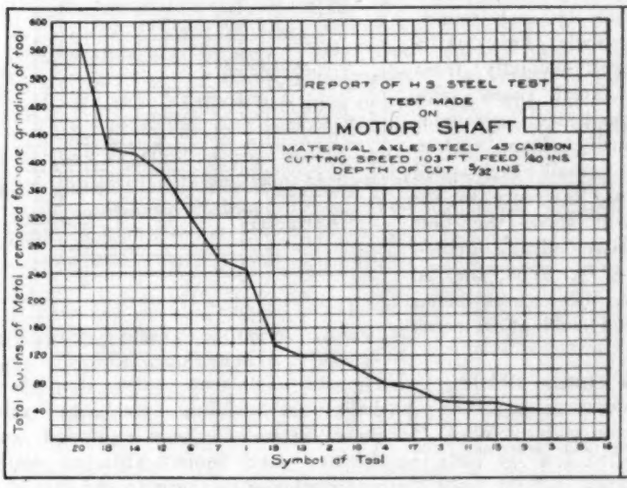

REPORT OF H S STEEL TEST
TEST MADE ON
MOTOR SHAFT
MATERIAL AXLE STEEL .45 CARBON
CUTTING SPEED 103 FT FEED 1/40 INS
DEPTH OF CUT 5/32 INS
Total Cu. Ins. of Metal removed for one grinding of tool
Symbol of Tool

FIG. 1—RESULTS OF TEST OF 20 DIFFERENT BRANDS OF TOOL STEEL

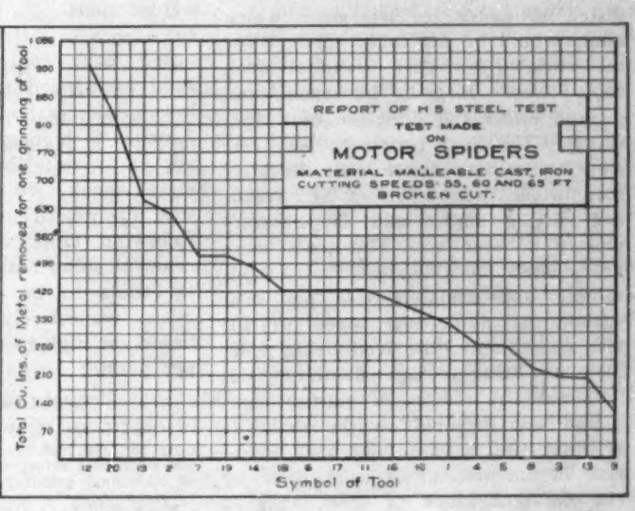

REPORT OF H S STEEL TEST
TEST MADE ON
MOTOR SPIDERS
MATERIAL MALLEABLE CAST IRON
CUTTING SPEEDS 55, 60 AND 65 FT
BROKEN CUT.
Total Cu. Ins. of Metal removed for one grinding of tool
Symbol of Tool

FIG. 2—SAME TOOLS TESTED ON MALLEABLE CAST IRON SPIDERS

ties. Considerable development was necessary, however, before the high cutting speeds and durability, which are common today, were rendered possible. The annexed table indicates some of the changes which have been

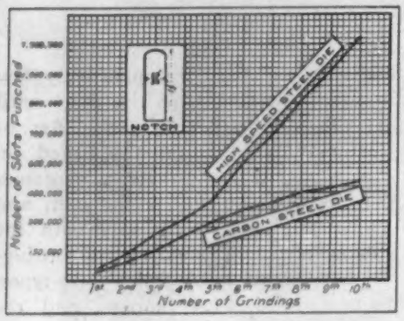

Number of Slots Punched
NOTCH
HIGH SPEED STEEL DIE
CARBON STEEL DIE
1st 2nd 3rd 4th 5th 6th 7th 8th 9th 10th
Number of Grindings

FIG. 3—RESULTS OF DIE TESTS

made in the chemical composition of high-speed steel up to the present date:

	Mushet. (Air hardening).	Midvale. (Date 1895).	Recent make.
Tungsten	5.441	7.723	16.28
Chromium	0.398	1.830	4.26
Carbon	2.150	1.143	0.63
Manganese	1.578	0.180	0.10
Silicon	1.044	0.246	0.141
Phosphorus	.....	0.023	0.008
Sulphur	.....	0.008	0.018
Molybdenum	.....	.....	0.55
Vanadium	.....	.....	0.26
Cobalt	.....	.....	3.47
Nickel	.....	.....	Trace
Copper	.....	.....	Trace

While this research and development finally benefited the user, he was at first involved in considerable expense in efforts to select, from the many brands available, the best steels to use for different purposes. The following investigation is typical of the tests which were carried out by users at about that time.

Selective Tests of Tool Steels

Twenty different brands of tool steel—ranging in price from 38 cents to $1 per pound—were selected and tested in order to determine which kinds would be the most efficient for the work. From each brand of steel, tools were forged, hardened and ground under the direction of a specialist. The heat treatment was carried out in accordance with the steel manufacturer's instructions, and standard cutting angles and shapes were closely adhered to. The tools were first tested on axle-steel shafts, containing approximately 0.45 per cent carbon, at a cutting speed of 103 feet per minute, the feed being 1/40-inch and the average depth of cut 5/32-inch. A stream of cutting compound was directed on the tool. It is interesting to note the wide variation in the amount of work done by the different kinds of steel. Fig. 1 shows that the tool giving the best performance removed 570 cubic inches of metal for each grinding, whereas the tool at the bottom of the list removed only 38 cubic inches of metal per grinding. Three tools were made from each kind of steel, and the best result from each set of tools was recorded in the chart.

Intermittent Cutting Test

A second test was made on malleable cast iron spiders, which, having four ribs each, provided an intermittent or broken cut, thus giving the tools a more severe test than would have occurred had the cut been continuous. A cutting speed of 55 feet per minute was used on the first four spiders. This was increased to 60 feet per minute on the next four spiders, and a speed of 65 feet per minute was maintained on all subsequent spiders until the tool was ready for regrinding. In all cases, 1/12-inch feed was used, and the average depth of cut was 7/32-inch. Fig. 2 shows the amount of metal removed for each grinding of the various tools; the symbols shown on the curves were for purposes of identification of the steels used.

Superior grades of high-speed steel, though of high efficiency from a cutting standpoint, are often rejected on account of the high cost of the investment. Tool holders reduce this investment to some extent, however, but their use is somewhat limited, owing to the fact that in many places a solid tool can be manipulated to greater advantage.

From time to time, various tests have been made on butt-welded tools and on tools formed by welding tips of high-speed steel to low grade carbon steel shanks. The electrical welding process as applied to work of this kind is quite successful. A very important consideration, however, is the one of relative cost of solid and welded tools. To illustrate this point, consider a ¾-inch by 1½-inch round-nosed lathe tool made, first, as a solid high-speed tool; secondly, from low grade carbon steel shank with 2 inches of high-speed steel butt-welded on same; thirdly, from carbon steel shank with small high-speed steel tip welded on. Reference to the following table will show the first costs of solid, butt-welded and welded tip tools to be $2.74, $1.08 and 80 cents, respectively, the figures being based on high-speed steel at 60 cents per pound:

SOLID TOOL.

(¾ by 1½ by 12 inches long.)

Cost of first tool	$2.74
Six additional reforgings and harden'gs	1.20
69 additional grindings	5.17
Total cost during life of tool	$9.11
Salvage	1.07
Net cost	$8.04

BUTT-WELDED TOOL.

(¾ by 1½ by 8½ inches, carbon steel; 3 Pcs. ¾ by 1½ by 2 inches, H. S. S.)

Cost of first tool	$1.08
Two additional pcs. of high-speed steel	.80
Preparing for and welding (2 welds)	.46
Six additional reforgings and harden'gs	1.20
69 additional grindings	5.17
Total cost during life of tool	$8.71
Salvage	.04
Net cost	$8.67

WELDED TIP TOOL.

Cost of first tool	$0.80
Six high-speed steel tips	2.04
Preparing for and welding (6 welds)	1.20
69 additional grindings	5.17
Total cost during life of tool	$9.21
Salvage	.04
Net cost	$9.17

Thus the initial outlay for the solid tool is considerably greater than that for the welded tip tool. The cost of up-keep must be considered, however, and further reference to the table, which is based on 70 grindings as being the life of each tool, shows that the final costs of the solid tool, the butt-welded tool and the welded tip tools are $8.04, $8.67 and $9.17, respectively. It may appear, at first sight, that the allowance for salvage on the solid tool is high, but when it is considered that scrap ends are forged down and used for smaller tools or the teeth of milling cutters, it will be seen that the depreciation is small.

Marked Increase of Output

The substitution of high-speed steel for carbon steel and mushet steel naturally took place first in those cases where tools were comparatively simple in construction—as in lathe and planer tools—and while the increased output, due to greater cutting speeds and feeds, was truly remarkable, there was a still more remarkable increase in the output from the

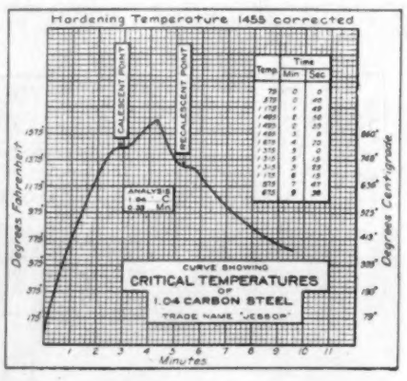


FIG. 4—CRITICAL TEMPERATURE OF A SPECIAL STEEL

drills and milling machines, after these latter had been equipped with the new steel tools. This, no doubt, was due in a measure to the fact that in the case of the lathe and planer, the transition was frequently made

from mushet steel, with its cutting speed of approximately 30 feet per minute to high-speed steel of perhaps 60 feet per minute cutting speed; whereas, in the case of the drill and the miller, the change was made, in the majority of cases, from slow-speed steel tools directly to the new high-speed steel tools.

High-speed steels are now commonly used in modern machine shops for turning, boring, planing, shaping, milling, drilling and punching, the most noteworthy exceptions to this rule being found in shops where the product consists chiefly of articles made from the softer metals or their alloys, in which cases the carbon steels are often preferred. There are many purposes, however, for which carbon steel tools are used and will continue to be used in all shops. High-speed steels also are being used with success in the manufacture of slotting dies. There are at least two reasons why the use of high-speed steel for this purpose has been somewhat delayed, the first being that the speed of a punch or shear press is usually determined by the speed at which work can be fed; the second being due to the risk in hardening expensive dies. The following record of tests made with dies of carbon steel and high-speed steel is interesting. The work selected was the punching of notches in sheet steel of 0.0172-inch thickness. This was done on an automatic notching machine which runs at the rate of 300 notches per minute—the maximum speed at which the work could be indexed with accuracy. Carbon and high-speed steel were run at the same speeds, and it was found that carbon steel dies required grinding oftener than the high-speed steel dies in the ratio of 2.4 to 1. The curves given in Fig. 3 show the number of notches punched for each grinding of the die. It can be seen that at the end of the tenth grinding the die made from the high-speed steel had punched 1,239,000 notches, whereas the carbon steel die had punched 506,000 notches.

The use of high-speed steel dies increases the production somewhat, as they do not require grinding so often as carbon steel dies. The greatest saving, however, is to be found in the cost of the dies themselves. From data collected from tests similar to the above, it has been found that the relative costs of carbon steel dies and high-speed steel dies, for a given production, are approximately as two is to one. The loss due to hardening is very small, being slightly under one per cent.

The heat treatment of the new steels has remained fundamentally the same since they were introduced. Modifications have been made in the apparatus used for the heat treatment of tools. Electrically heated oil baths provide a handy means of drawing the temper. Lead baths are also used, with thermo-couples and galvanometer for temperature control. The galvanometer has four contacts—one for each thermo-couple and one for the off position. The accuracy of each electric pyrometer is checked occasionally with a standard instrument, which is kept for that purpose. Heat treatment records are conveniently kept in a card index.

When a new brand of steel is introduced, the determination of its critical temperature is usually necessary. This is conveniently carried out by means of a small electric furnace, in conjunction with a thermo-couple and galvanometer. Small pieces of steel under test are clamped to the side of the thermo-couple and inserted in the furnace. The temperature of the furnace is raised slowly, and simultaneous readings of time and temperature are taken, from which the critical temperature curve of the steel is plotted. Fig. 4 shows such a curve which was taken from a piece of 1.04 per cent carbon steel.

A substance placed upon the market under the name of stellite has claimed considerable attention as a high-speed cutting material. Stellite is not a steel. A recent analysis of a sample gave the following chemical composition:

Cobalt	52.03
Chromium	29.36
Tungsten	12.71
Iron	5.35
Nickel	0.45
Manganese	0.24
Silicon	0.09
Molybdenum	Trace

Stellite cannot be forged, rolled or machined, is extremely brittle and tools made from it must be well supported close to their cutting edges. It is supplied by the makers in short cast bars of such section as may be ground to form tools of simple outline and construction; hence its uses are at present somewhat limited.

Stellite tips may be brazed or electrically welded to shanks of carbon steel, and when so treated, may be used until repeated grindings render the stellite very thin. Fig. 5 shows two turning tools which were formed by welding stellite tips to carbon steel. These tools continued to cut well until their tips were reduced in thickness, by repeated grindings, to the condition shown. The photograph also shows two tool holders which support their tools close up to the cutting edges and are, therefore, especially suitable for stellite.

Under favorable circumstances, cutting speeds may be increased by the substitution of stellite for high-speed steel. The following instances may be of interest. Thin cast iron frames, which were very hard on account of their being somewhat chilled, were successfully faced at a cutting speed of 300 feet per minute by the use of stellite, whereas the speed for high-speed steel was 45 feet per minute. In this case, there was also a decided reduction in the time spent on grinding tools, the stellite tool finishing nine pieces for each grinding as against one piece finished for each grinding of the high-speed steel tool. On an axle-steel shaft of 0.45 carbon, the cutting speed was increased from 100 feet per minute to 305 feet per minute, when stellite was substituted for the usual high-speed tool. Sandy brass castings have also been machined with considerable success by the use of stellite tools. At present, stellite does not give good results where the cutting is irregular or broken, but where a continuous cut of uniform depth, with small feed, can be used, it will frequently be found that a high rate of cutting, together with a uniform size may be maintained.

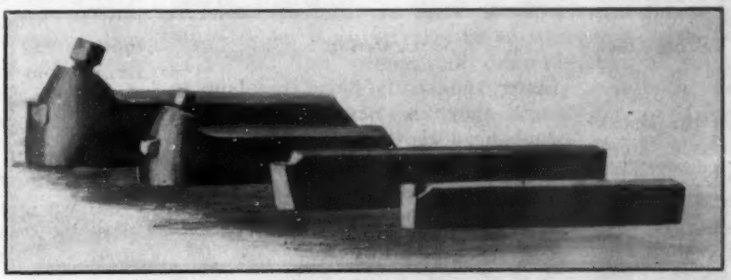


FIG. 5—STELLITE-TIPPED TOOLS AND TOOL HOLDERS

Machine tool manufacturers have shown considerable enterprise during late years in dealing with the problems and possibilities presented by the introduction of the new steels. Since greater cutting speeds, feeds, and cuts were possible, it became apparent at once that machine tools of greater strength and rigidity, combined with closer speed regulation, were highly desirable. Also, since the cutting speed had been increased, the handling time became of greater relative importance; consequently, machine tools have been produced in which the leading features and improvements are rigid construction,

large wearing surfaces, improved means of lubrication, superior balance both in the parts of the machine and in the tool reactions, an increased number of available cutting speeds and feeds, closely graduated indexes, enhanced facilities for simultaneous operation and automatic and semi-automatic time-saving devices. Thus, the selection of the most suitable machine for a specific manufacturing operation has become a matter which requires considerable skill and experience.

The selection of machinery for machine shop purposes must depend not only upon the design, size, accuracy and finish required by each class of work, but also upon the quantities which may be manufactured and carried in stock at one time. The following practice, which calls for the use of parting-off machines, centering machines, special rough turning and spotting lathes, cylindric grinding machines and milling machines has been found satisfactory for the manufacture of accurately finished steel shafts, which range in size from 1½ inches in diameter by 15 inches long to 4½ inches in diameter by 5½ feet long and are manufactured in quantity.

The material from which the shafts are made is hot-rolled axle steel, which has been carefully selected under rigid inspection at the mills. It contains about 0.44 per cent carbon and 0.55 per cent of manganese. The ultimate tensile strength must not be greater than 90,000 pounds per square inch or less than 75,000 pounds per square inch and the elongation in 2 inches must not be less than 18 per cent. The material is in about 22-foot lengths, when received from the mills, and is cut to the desired lengths after arrival at the works, these lengths being usually 1/32 inch to 1/16 inch longer than the finished lengths of the shafts. Several kinds of machines are used for cutting this material to lengths. Other types were largely abandoned in favor of the revolving-cutter type of cutting-off machine. In the external revolving-cutter type, high-speed steel cutters, which are adjustable, are inserted in the rim of the revolving disc. The machine is provided with a very handy pneumatic clamping device by means of which the work is rigidly and rapidly fixed in position.

In another machine, the cutters are arranged around an inner circumference of an annular disc. This machine is built to take stock up to 6 inches in diameter, and the cutting is done by eight inserted high-speed steel cutters. Four of these cutters are round-nosed for roughing and four are square-nosed for finishing, so arranged that each square tool follows a round-nosed tool. The machine is driven by a constant speed motor of 710 revolutions per minute, which gives a cutting speed of 47-3/5 feet per minute. The length of bar stock is conveniently adjusted by means of the hand wheel, rack and gearing, one of the round ways upon which the carriage slides being graduated in feet and inches. A pneumatic clamping device, similar to the one used with the external machine, is also used with this machine. As these machines are used on rectangular and round bars, both external and internal designs are desirable, the latter being more suitable for round stock. The following figures were obtained by tests made on 4.75-inch diameter by 22½ feet long axle-steel stock:

	6 in. Hollow-spindle cutting-off machines.	6 in. Internal cutting-off machines.
Cutting speed, per min.	64.5 ft.	47.6 ft.
Feed, per min.....	0.25 in.	2.0 in.
Total time on six cuts.	1 hr., 16 min., 10 sec.	33 min.

Centering

After the shafts have been cut to length they are next centered in a double-head centering machine, which has two self-centering chucks. By this machine, true alignment of centers is secured, and as only one setting is required for centering both ends, this method is quicker than the older method. Due to rough turning operations, the centers are subject to very heavy stresses, and where the centers are not in alignment these stresses are greatly increased, the centers wear rapidly and the shaft does not run true. This renders necessary an increased allowance of metal for grinding. The centers are drilled with a combination center drill, which drills the pilot hole, countersinks to 60 degrees and also counterbores the shaft to a depth of 1/16-inch. As all shafts on one order must have their centers of uniform depth, so that length stops may be used on the lathe, the center drill is provided with a stop.

Rough-Turning Shafts for Grinding

The third operation on shafts is that of rough turning and spotting. Shafts from 1½ inch diameter by 15 inches long up to 4½ inches diameter by 5½ feet long may be conveniently rough turned, spotted and threaded in a special lathe. This lathe is equipped with adjustable stops for length and cross feeds, which, after the first setting, render calipering unnecessary and insure uniformity in the spotting for grinding. There are three tools, one for roughing, one for spotting and one for rough cutting the thread. Four cuts are taken with the threading tool, after which an adjustable die head, arranged over the tail-stock spindle and lathe center, cuts the threads to within 0.010 inches of the finished size. The thread is brought to size by means of a hand die after all the chief operations have been performed on the shaft; this insures a true thread and corrects any abuse which the threads may have received in handling, while going through the various operations.

The next operation is that of milling keyways. These are milled on a heavy vertical milling machine built for work of this class and provided with a two-fluted end-mill cutter. The cutter or end-mill is held in the spindle of the machine by a draw in collet, run at a high speed and flooded with a cutting compound. This shaft is located in the machine by a self-centering device and an end stop. The keyway is then cut by feeding the cutter down to a depth stop by hand, after which the longitudinal feed is used and automatically thrown out by a stop, which is set to suit the length of the keyway.

If the ends of keyways are not required to fit round-ended keys, it is found economical to place a number of shafts on "V" blocks and mill them by means of gang milling cutters, which are carefully spaced on the arbor. Where keyways have been cut by this latter method and the design calls for round-ended keys, it is necessary to transfer the shafts to an end-milling machine; and experience shows that it is more economical to complete the operation on one shaft at a time on a vertical machine, because the extra handling and time taken to re-set the work for end milling more than offset the gain made by milling several keyways simultaneously.

The final machining operation on the shafts is that of grinding. Satisfactory grinding results can only be obtained by the use of rigid and accurately aligned grinding machines, in which the work is well supported by centers and steady rests, and where due attention has been paid to the grade of wheel, its diameter, width, peripheral speed and also speed and traverse of the work. Careful attention must also be given to the truing of the wheel, if a true and high finish is desired. The method of handling and grinding shafts depends somewhat on their size and the quantities manufactured at one time. On all heavy shafts it is the practice to

(*Continued on Page* 718b.)

Uses of the Quick Forging Press

Refinements of Design and Increased Speed of Operation Have Largely Increased the Productiveness of This Tool During Past Decade

BY A. J. CAPRON

DURING the past ten years, great developments have taken place in the art of forging. Throughout the widening field of industries, the requirements of those desiring forgings have increased rapidly. Larger forgings are required for the increased calibre of guns now coming into use, and for turbine drums, wheels and spindles. In many cases an ingot of as much as 100 tons weight is demanded. Forgings also are being used in some cases, in preference to steel castings. This applies particularly to marine work, where reliability is the first consideration, and where some saving in weight is of more consequence than economy in production. It also applies largely to forgings of all kinds for general engineering work. When steel castings were introduced, they were used in many cases to replace iron and steel forgings, the steel castings effecting a great saving in the cost of machining, particularly in the case of articles of intricate form. But the introduction of high-speed steel during the last 15 years has so reduced the cost of machining that forgings have been replacing castings, in many cases advantageously as regards the cost of production, and their use in this direction is extending. This development is greatly assisted by the improvements that have been made in the art of forging. When coal-fired furnaces are used for heating the forgings, it is often possible, by means of the waste heat from the furnaces, to raise sufficient steam for working the press. This is generally more convenient and economical than using gas-fired heating furnaces and independently fired boilers. The following table gives the maximum diameter of ingot that each power of press is capable of handling effectively, and the equivalent power of a steam hammer:

Diameter of Ingot, inches.	mm.	Power of Press, Tons.	Power of Hammer, Tons.
5	125	100	0.50
6	150	150	0.75
8	200	200	1
10	250	300	2
12	300	400	3
14	350	500	4
16	400	600	5
20	500	800	7
24	600	1,000	10
30	750	1,200	15
36	900	1,500	20
48	1,200	2,000	40
60	1,500	3,000	80
72	1,800	4,000	120
84	2,100	5,000	
96	2,400	6,000	

For the production of the heavier forgings, presses have been used in preference to hammers for as much as 30 years in many of the large steel works, but such presses are comparatively slow in their action and it is only within the last ten years that great improvements have been made in their design and construction, and more particularly in their speed, which has rendered presses suitable for almost all classes of work, except the lightest forgings, which come within the range of small steam hammers or drop stamps.

As stated above, for the heavier classes of work, presses have been used in many of the principal steel works for as much as 30 years, the power of such presses most generally used, up to 20 years ago, being from 2,000 to 3,000 tons, though during this period some much more powerful presses up to 10,000 tons were put down for forging armor plate and special purposes. During the ten years, preceding the decade just past, owing to the increased size of guns and other forgings required, a good many presses of 4,000 tons have been adopted. During the last ten years, owing to the further increase in the size of guns and also to the larger forgings required for marine work, particularly turbine drums and spindles, the power of press required has increased correspondingly, 6,000 tons being the power most recently adopted for the heaviest work of this class. To explain the development in the use of the press some mention must be made of the improvements which have been introduced in the method of driving. The earlier forging presses were generally driven by means of pumping engines, working direct into the press cylinders, the working pressure being usually from 2½ to 3 tons per square inch. For large presses this method gives satisfactory results, but it has never been used to any extent for presses of medium or small power for which greater simplicity and a higher speed of working, especially in finishing, are more essential. Another method is to make the press

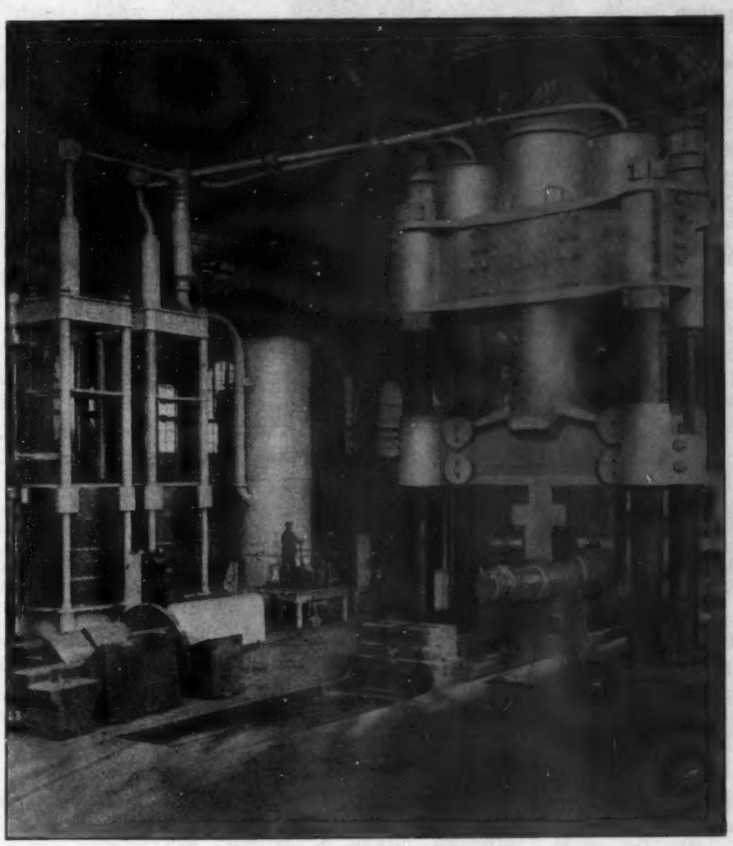


FIG. 1—MODERN 600-TON FORGING PRESS IN OPERATION

From a paper read at the International Engineering Congress, San Francisco, Sept. 20 to 25.

purely hydraulic, working it from an accumulator. For certain special work, such as piercing projectiles or billets for tube making, in which a long stroke without any pause is desirable, this system is undoubtedly the best. For ordinary forging operations, however, in which a short rapid stroke is essential, this system has only been adopted to a limited extent, and is applicable only to presses of comparatively small power.

The system that best fulfills the requirements is the steam, hydraulic intensifier. For a good many years it has been used to some extent, but it is only within the last ten years that it has come into general use and been adopted extensively for presses of small and medium power as well as for the heavier forging presses. The advantages of the steam intensifier press are that, in its latest and best form, it is capable of fulfilling adequately all the requirements of forging, including rapidity of action in all its movements. The idle stroke, when lifting the press-head and bringing it down to its work, should be from 6 inches to 12 inches per second, according to the power of the press and the nature of the work. The forging stroke should be up to 3 inches per second, according to the resistance of the forging. There should be no pause when the tool first touches the work, that is, before the forging stroke commences, or at the end of the forging stroke. The return stroke should commence directly the penetration is completed, any pause causing loss of time as well as chilling the forging. The length of the forging stroke is usually from 1 inch up to 6 or 8 inches in the case of very large presses, and the speed forging ranges from 10 up to 50 strokes a minute, a total penetration of 60 inches a minute being obtainable when the power of the press is well up to its work and the forging handled expeditiously. For rounding or finishing a forging, a very rapid stroke is desirable, a good intensifier press of as much as 6,000 tons being capable of working up to 40 strokes a minute and smaller and proportionately quicker presses up to 100 strokes a minute. With these speeds of working, an efficient control gear is desirable, both to limit the forging stroke and also to prevent any overrunning of the intensifier in case the load on the press is suddenly removed, owing to the forging or tool slipping or from any other accidental cause. So successfully has efficient gear control been applied to intensifier presses, that they can be worked quite safely and easily at the high speeds mentioned. Presses already constructed on this system range from 100 up to 6,000 tons power, the larger presses giving proportionally equally as good results, both in forging and in rapid finishing strokes which are required. Fig. 1 illustrates an up to date forging press of 600 tons power, engaged in forging a solid shaft. This press is driven by two intensifiers, arranged to work simultaneously or independently by means of catches on the handling lever. Working simultaneously, the intensifiers give a forging stroke of 10 inches, and a speed of from six to ten strokes per minute according to the penetration required. When short strokes for finishing are required, either intensifier can be used and the press can be worked up to 40 strokes per minute.

The full equipment for such a press,

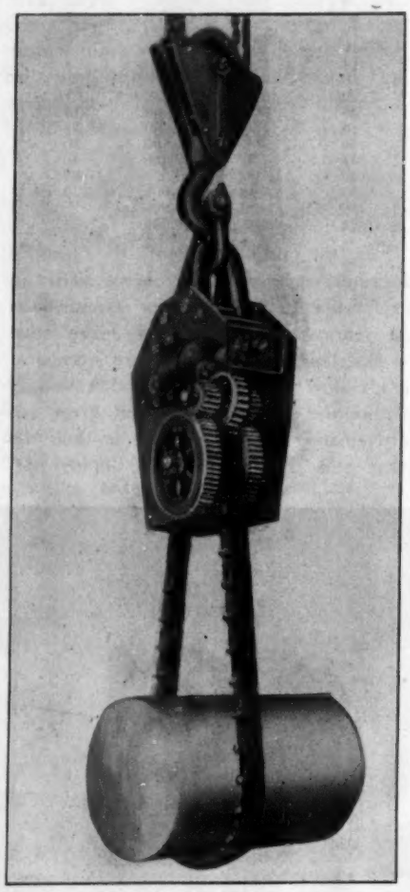


FIG. 2—ROTATING GEAR FOR FORGING

to enable it to deal advantageously with the various classes of work, includes the following:

An extended base of sufficient strength so that the full power of the press can be exerted on the mandrel blocks when they are spaced at the maximum distance apart required for expanding work, such as turbine drums or gun jackets.

A manipulating gear for handling forgings without the use of a crane. This is particularly useful for certain classes of work, such as forging armor plate and turbine wheels and also in some cases for cogging ingots.

A transverse tool changing gear. This is useful for forging crankshafts and similar work when it is desirable to change from flat tools to V shaped or swaging tools. This gear enables both top and bottom tools to be changed very quickly without taking the forging from under the press.

A mandrel gear, giving the mandrel blocks a travel of about 30 feet on each side of the press.

A turning gear for rotating the forging. The most convenient form is a self-contained electrically-driven gear, suspended from the crane hook. Fig. 2 shows such a gear. Preferably, this should be provided with a friction clutch which slips during the instant that the press grips the forging.

A press with the above equipment is suitable for practically all classes of heavy work.

Fig. 3 illustrates a solid, turbine spindle forging, made from an 80-inch octagon ingot weighing 116 tons, the finished weight of the forging being 55 tons. Fig. 4 shows a turbine drum, forged and expanded, made from a 64-inch ingot weighing 85 tons, the weight of the forging being 35 tons. Fig. 5 illustrates a hydraulic cylinder, forged and expanded. This forging required an 80-inch ingot weighing 116 tons. The finished weight of the forging was 63½ tons and its rough machined weight was 42 tons, its principal dimensions being:

Length, 14 feet 1 inch.
Diameter over collar, 6 feet 6½ inches.
Diameter of body, 5 feet 7 inches.
Diameter of bore, 46 inches.

For general forging work, all large presses, down to 2,000 tons power, should be fitted with mandrel gear, which greatly facilitates the work under the press and the handling of the forgings. It can also be used conveniently for changing the tools when transverse-tool changing gear is not included in the equipment. For medium sized presses of from 1,000 to 1,500 tons, a simple form of mandrel gear is often desirable and is generally well worth the comparatively small additional cost.

For slabbing and punching tire blanks, presses have been adopted with satisfactory results. The power of press generally used for this purpose varies from 1,200 tons to 2,000 tons, but in one instance a press of 5,000 tons has been put down for this class of work. A press of this power can slab the largest tire blank at a single stroke and so is capbale of a very large output. A 1,200 ton press, without any mechanical appliance for handling the blanks, has produced as much as 40 tons of wagon tires in an 11-hour shift, and 48 tons of locomotive tires in the same time.

More power is, however, preferable for this class of work, and recently presses of 1,500 to 2,000 tons have been widely used. The most recent instance is a 2,000-ton press fitted with a manipulating gear and rotating table. The rotating table, which is mounted on a slide, enables the piece to be carried under the press and slabbed very rapidly

by successive strokes, and the manipulating gear centers the blank so that the top punch can be entered correctly and then lifts it on to the bottom punch, ensuring a hole truly central and without the formation of any fin. This gear entirely dispenses with any manual work in handling the piece under the

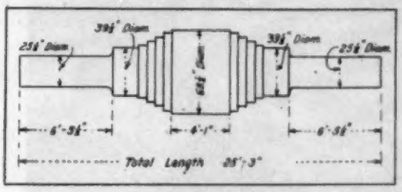


FIG. 3—LARGE TURBINE SPINDLE

press, and also greatly increases the output.

After the slabbing and punching, the tires are frequently passed straight on to a roughing mill before the final rolling in a finishing mill, but in some cases, a second press is used for becking or expanding the tires before rolling. This has the advantage of closing the material, which has been stressed to some extent on its periphery, by the slabbing. For this process, a press of from 500 to 800 tons is generally used and is capable of an output of from 40 to 50 tons in a shift.

During the last few years the use of disc and Schoen wheels has extended very greatly and consequently the forging of these is a matter of very considerable importance. Two methods have been adopted for forging these discs and wheels. One method is to use a press of sufficient power to forge the wheel in one or two operations, the top tool covering the whole surface of the wheel in the final squeeze. This necessitates a very powerful press, generally of about 8,000 tons. By the use of the quick acting press, such wheels can, however, be forged under a press of much smaller power. In several cases, a 1,500-ton press, fitted with a rotating table for revolving the work, has been used. In this case, the top tool, which is about 12 inches wide, is made to the section of the wheel so that as the blank revolves, the successive strokes of the top tool on its surface shape the forging and spread it over the whole surface of the bottom circular tool.

Axle Forging

In the past, axle forging has been done chiefly under hammers, it being easier by this means to get rid of the scale and consequently to obtain a better surface. In several recent instances, quick acting presses have been used for the first process of cogging the ingots and forging the axles roughly to shape, and as some governments and many railway companies require in the case of pressed forgings only half the sectional reduction that is called for when the ingots are cogged in a rolling mill or under a hammer, the use of a press for this purpose is additionally advantageous. The output of an 800 ton press in cogging from the ingot and rough forging is from 20 to 30 tons of axles in a shift.

For finishing axles, the difficulty of the scale, mentioned above, presents itself, but this has been to a great extent surmounted by the use of bracken or some other suitable substance for detaching the scale, and by making the tools sufficiently wide to prevent the scale which is detached from being pressed in. The finishing tools have generally three grooves about 12 inches apart. To obviate the objectionable side stresses that would come on the press when finishing in the outer grooves, the tools are mounted on slides, worked by power, so that the top and bottom tools move simultaneously and the grooves in

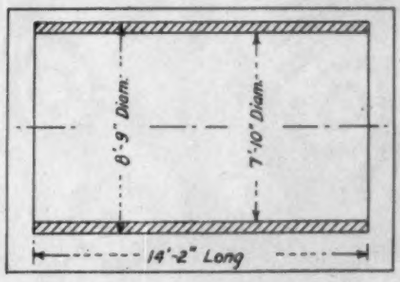


FIG. 4—35-TON TURBINE DRUM

use can be brought instantaneously to the center of the press.

For the purpose of forging external armor piercing shells up to the largest calibres at present required, quick acting presses of from 1,200 to 2,000 tons have been used to a considerable extent. For the processes of piercing and drawing, which require a long continuous stroke, purely hydraulic presses worked from an accumulator are more suitable.

In the manufacture of forgings of simple form when large quantities are required, dies can be used and in many cases the forging can be produced by a single stroke of the press. Dies also can often be used in the case of forgings of more complicated form, but then it is generally necessary to forge the piece roughly to shape before using the dies to produce the exact dimensions required.

For many special manufactures requiring a considerable number of similar forgings so that special tools and dies can be provided, the use of high speed presses has proved advantageous. An interesting example of making special forgings is the manufacture of hubs under a 150-ton quick-acting press, from a piece of round stock. A wide external flange is first forced up in the center, and they are then pierced and the upper end cupped in special dies, the production being 100 hubs in 10 hours.

Apart, however, from special application, presses of small and medium powers are beginning to be used to a very considerable extent for general engineer's forgings, both in forges and in engineering works. The powers used for this purpose in engineering works, range from 150 to 800 tons and in forges, up to 1,500 tons; and it can be safely stated that such presses have proved generally profitable.

Use Presses for Repair Work

In several cases, 300-ton forging presses have been installed in steel rolling mills for general repair work, and have proved serviceable for this purpose, in enabling breakdowns to be dealt with promptly, thus greatly reducing the stoppage of the mill or other plant. Another application of interest is the use of quick acting presses for the manufacture of iron from the puddling furnace. With presses of sufficient rapidity of action, very satisfactory results have been obtained both in quality and output, the powers of presses generally used for this purpose being 400 and 500 tons. For naval repair ships, forging presses of a specially compact construction have been used, generally of 150 tons power.

Joseph Dixon Crucible Co., Jersey City, N. J. has published an exceedingly interesting 20-page treatise on "The Use and Abuse of Ball and Roller Bearings." It was prepared by F. J. Jarosch, chief engineer of the Bearings Co. of America. The text contains explanations and suggestions intended to be of service in the selection, mounting and lubrication of ball and roller bearings for all purposes.

FIG. 5—HYDRAULIC CYLINDER FORGING

The booklet is illustrated with 19 drawings.

The American Steel Foundries, Chicago, have completed the installation of a six-ton electric furnace of the Heroult type at its Indiana Harbor, Ind., plant.

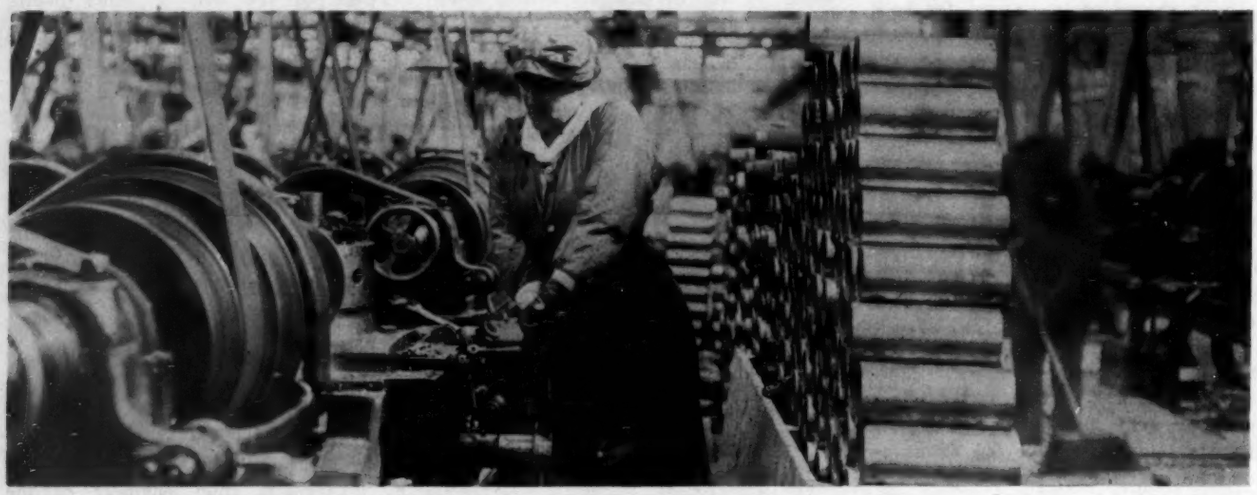
British and French Women Make Shells

A MISLEADING PICTURE

The English lady in this illustration seems to be engaged in some culinary occupation. In reality she is pouring resin into shrapnel shells in order to set the bullet charges

THE MODERN LA PATRIE

This sturdy woman, calm and resolved, working at the lathe so that her menfolk may have thunderbolts to hurl back the "boche" invader, symbolizes France herself—the united nation which is the France of today



THE BRITISH MATRON IS EQUAL TO THE SITUATION

What German warrior would not tremble, could he see this Boadicean dame, the light of battle in her eye, handling a modern lathe as deftly as she smashed windows and statemen's silk toppers a year ago? She is turning shell cases at the Vickers Ltd., plant, and when the war is over will doubtless take up suffrage work with even more ardor than before

PATRIOTISM WELCOMES THE HUMBLEST OF DUTIES

Willingness and intelligence have made the women volunteer munition workers a valuable factor in English arsenals and shops. These ladies are polishing high explosive shells so that the artillerists will have no trouble in loading the big guns to destroy enemy trenches

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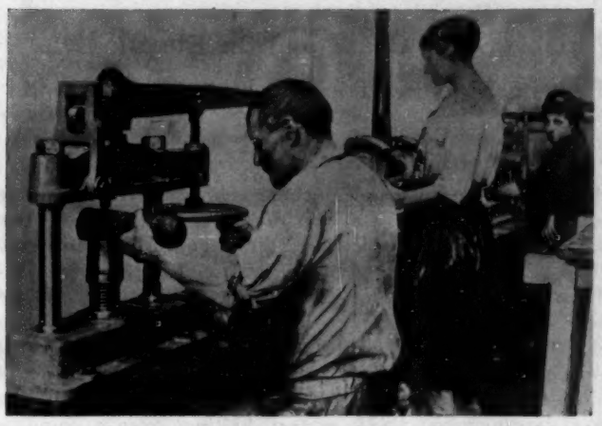
Prove as Capable as They Are Patriotic



MERE MAN IN THE MUNITION FACTORY

This illustration, showing a lone man drilling fuse holes in shells, in a factory full of women workers, speaks eloquently of wartime conditions in devoted France

FITTING INTERIOR TUBES IN SHELLS

English girls are setting a splendid example to the masculine stay-at-homes. In this they display no more patriotic spirit than do the daughters of Germany, France, and Austria

THIS WOMAN GAGES SHELLS EIGHT HOURS A DAY

Who could surmise the thoughts of these British gentlewomen as they toil through long hours making lethal weapons? In their faces is evident the stubborn pluck which their husbands and brothers displayed at Ypres and the Marne

BRITISH PATRICIANS IN PLEBEIAN OCCUPATIONS

Among the women who volunteered and were accepted for work in the ammunition factories recently, were Lady Gatacre, Lady Crawford, Lady Colebrook, and many other women of distinction

International News Service

Electric Power in the Machine Shop

The Development of High Speed Steel, Variable Speed Gears, and the Electric Motor Have Had a Profound Effect on Machine Tool Design

BY A. L. DE LEEUW

THOUGH the changes in machine tool design since the application of the electric motor are quite marked, it is difficult to indicate the exact responsibility of the electric motor for such changes, mainly because high-speed steels were introduced, practically speaking, simultaneously with the electric motor. The two causes may appear completely different, yet their effects have been much the same.

The introduction of high-speed steels called for greater speed, more power and better control. The electric motor afforded the means to meet these requirements. It was quite as often the case that heavier cuts were taken because more power was available, as that more power was provided because heavier cuts had to be taken. The main advantage of the application of an electric motor to a machine tool was, at first, believed to be the possibility of having individual drive for a machine and thus making it possible to place it anywhere in the shop, regardless of the location of other machines, or of the line shaft or other transmission machinery. This was especially an advantage in shops for large work, where the handling of a piece of work was as much of a problem as the actual machining. One of the main reasons why the majority of shops for large work were made of the lantern type was, that this construction allowed of a high bay in the center, in which a traveling crane could be operated, and of low bays on the sides, where countershafts could be located. It was possible, in this way, to have planers and boring mills with their drive under the low bay and their tables under the high roof, and thus serve them from the traveling crane without much trouble. Lathes and similar machines were placed completely under the high roof, keeping the countershaft attached to the gallery or low bay. Of course, this construction made it very difficult to serve the low bays by traveling cranes. Special constructions and special arrangements of travelers or jib cranes often were required to overcome this difficulty; but whatever arrangement was used, it was always more or less special, and a change of conditions in such a shop caused either a great deal of inconvenience, or else, extensive changes in the arrangement of machine tools and cranes. It was readily recognized that a universal arrangement of shops and equipment was needed, and it was equally readily recognized that a motor drive for machine tools would make such a universal arrangement possible.

From a paper read at the International Engineering Congress, San Francisco, Sept. 20-25.

Introduce Floor Plate System

Soon after the first introduction of electric motors for machine-tool drives, portable machines and the floor plate system of machining were introduced. Heretofore, portable machines could only be used by means of flexible shafting and, of course, this system was necessarily limited. Electric motors were especially applied to portable boring machines, slotters, milling machines, etc., and to punches and shears for boiler shops and ship yards. Lack of understanding of the requirements of such machinery and of the possibilities and limitations of electric motors, caused a great deal of dissatisfaction with the early machine-tool drives. However, the great merit of the electric motor drive was recognized, notwithstanding the large percentage of failures. The electric motor was the cause of a better understanding of requirements of machine tools, and the recognition of its limitations was the cause of improvement in the motor, which has now attained a high degree of efficiency for machine drives. It may be said that the motor and machine tools have influenced each other mutually.

Applying motors to portable tools made these tools so much more useful that the problem of providing more power for them hardly entered at first. Almost any speed or amount of power which the motor might impart was more than the tool had previously been given, and, therefore, the electric drive of the portable tools was successful from the start.

One of the first applications of electric motors to machine tools was the planer drive. The planer was considered an especially inviting field for the motor, because it would make it possible to place the planer in a better position in the shop. Considering that the planer at all times is a first operation machine, and, relatively speaking, is always a large machine, and that practically all large forgings or castings must go to the planer at one time or another, it was very important to have the planer where it could readily be served by an overhead crane. Electric drive for the planer was, however, not a success at first, and, in fact, has not been a complete success until quite recently, when the reversible motor was applied to the planer.

The amount of power required by machine tools has been, practically speaking, an unknown quantity. Little attempt had formerly been made to ascertain the relation between size of cut and the amount of power required, and there were only very vague ideas in circulation as to the pressure at the tool point for a given cut. The difficulties in the way of clean-cut tests to determine the amount of power were very great. The introduction of the electric motor made it possible to find the power for a machine drive with a high degree of accuracy and one of the first results of the introduction of the motor was, therefore, a better understanding of the power required by machine tools and the strains and stresses developed in their members.

It is probable that less attention would have been paid to the requirements of machine tools, had it not been for the introduction of high-speed steel, which made a demand on existing machine tools much in excess of their power. Trying to fit the machines to their new duties led to the making of tests, and motor drive made these tests possible. It may be asserted that all the existing knowledge in regard to machine tools so far as power, pressures, etc., are concerned is due to the electric motor as driving power for machine tools.

What is true of our knowledge of power, is also true of our knowledge of speeds of machine tools. Introduction of high-speed steel made it necessary to acquire some knowledge on this point, and the introduction of the electric motor made it possible to acquire that knowledge. It should be pointed out, that, in this respect, the machine tool has influenced the electric motor as much as the motor has affected the machine tool. At a

very early date in the history of the application of the electric motor to machine tools, it was found desirable to control the speed of a machine tool very closely; and almost at the very beginning of the introduction of the electric motor, attempts were made to electrically control the speed of a machine tool. The systems used to accomplish this were very crude and show conclusively that the electrical and machine-tool people did not understand each other's requirements. Series-wound motors were applied where shunt-wound motors were required; the speed of shunt-wound motors was regulated by means of armature resistance, and similar errors were frequent. Though the errors thus made were very glaring and were understood by some even at that time, the very ignorance existing on these points was beneficial, for the thought that it was possible to control the speed of a motor brought home the desirability of controlling that speed and made the machine-tool builder see visions of building a motor into his machine. In fact, some of the earliest applications of the electric motor to machine tools went further in this respect than anything that has been done since. Special motors were designed to fit into the head-stocks of lathes and other machines, and though these attempts were necessarily failures, they established an ideal toward which later designers have been working.

Advantages of Motor Drive

It may be said, in general, that the electric motor has influenced the machine tool beneficially along the following lines:

Better knowledge of the data governing the design of machine tools.
Greater possibilities in regard to power.
Closer control of a machine tool in regard to speeds, stopping and starting.
Flexibility of the use of machine tools, by making them portable and by making a better shop construction possible.

In the early days of the application of the electric motor to machinery, very little effort was made on the part of motor builders to have their product suitable to the machine to which it was to be applied. This was true in regard to the electrical characteristics as well as to the mechanical construction of the motor. The constant contact with the problems of application of motors made the motor builders put forth their best efforts in improving the motors. It may be said, however, that the intrinsic design of electric motors has not been materially affected by their various applications, except in one particular. The demands of the various applications of the motor have led to the adjustable speed motor in its various forms. For the rest, the influence of machines on the motor has been in the direction of mechanical design and workmanship. It may be said that the influence of machinery on the electric motor has been on its detail, but not on its general principles. Quite the opposite is true with the influence of the electric motor on machine tools. The writer believes that the most marked and most beneficial influence of the electric motor on machine tools has been the bringing into view of the lack of fundamental knowledge of machine tools, and that it has opened up a new era for the machine tool, which may be called the scientific era.

Tools Were Result of Needs

Machine tools have been the product of the requirements of mechanics. They were simply contrivances to help the mechanic in his work, and were more or less highly developed implements. Their various features were products of development and evolution, rather than of invention. The scant knowledge of their principles was the result of observation, rather than of experimentation. Mathematics had never been applied to machine tools. The stresses and strains to which machine-tool members were subject were not known. The forces required in a machine tool and the amount of power for certain work to be done in the machine tool were absolutely unknown, and, what is more, this lack of knowledge was not recognized as such. It is due to the electric motor that this condition of affairs in regard to machine tools has become recognized and that efforts have been made to put their design and application on a more scientific basis. It must also be stated here that very little has been done, so far, along this line. Nevertheless, we must thank the electric motor for the fact that we are now aware of our ignorance and are at last in a position to seek for knowledge and data on which a theory of machine tools may ultimately be built.

Motor Permits Power Measurement

The electric motor has brought this about because it made it possible to measure with a fair degree of accuracy the power required for the drive of machine tools. Practically speaking, absolute ignorance existed 20 years ago in regard to the power consumption of individual machines. A few dynamometer tests had been made to ascertain the power transmitted by some driving belts, but the conditions under which the tests had been made did not allow of careful instantaneous measurement, so that the best that could be done was to get some general idea of the average amount of power consumed. The simplicity of the method of determination of the power consumption by an electric motor, and the possibility of not only following with the eye but actually recording fluctuations in this power consumption, led to a great many tests in a very short time and produced more accurate knowledge of power conditions in machine tools than had ever been brought to light before. By observing speeds at the same time, valuable information was obtained in regard to the slippage of belts, so that the knowledge of the properties of belting for power transmission was vastly increased. One of the first results of these tests was to show up the fact that the capacity of belts for power transmission had heretofore been underestimated. Shortly before the introduction of the electric motor on machine tool drives it was considered that 40 pounds pull per inch of double belt was correct. Shortly after the introduction of the electric motor, 50 pounds was considered proper for single belts and 60 pounds, or even more, for double belts, and it was further discovered that under special conditions the capacity of a belt might go very much higher.

New Steel Creates Emergency

It is doubtful whether machine-tool builders would have taken the full advantage of this possibility of determining the power of machine tools, if it had not been that necessity drove them to it. This necessity was brought about by the fact that simultaneously with the introduction of the electric motor came high-speed steel, which made it possible to take cuts in metal theretofore deemed impossible or, at least impractical. The demand for increased power and speed made it absolutely necessary to determine the relation between the metal-cutting capacity of a machine tool and the power required to drive it. Shortly after the introduction of high-speed steels, machine tools were built for similar purposes but with entirely dissimilar drives, one maker recommending perhaps a five horsepower motor, while another maker would recommend for the same machine a 15 or 20-horsepower motor.

It was soon found that the relation between the amount of cut and the amount of power was not so simple as it was at first supposed to be. Not until recent years was it gen-

erally recognized that a great many elements would affect this relation; and even today there is very little positive knowledge in regard to it. Nevertheless, it may be said that the electric motor gives us the means to investigate this relation scientifically, and, at the same time, the electric motor should be given credit for having started the investigation.

Design Becomes More Scientific

Not only the power for the drive, but also the power required for the feed was more closely investigated, and, as a result of the new knowledge, it became possible to design the members of machine tools more nearly along scientific lines, thus producing better proportions of the parts of machine tools. It became possible to measure deflection of the parts of frames under given pressures, or under given conditions of work; and much has been learned in regard to rigidity or lack of rigidity of machine tools. However, we are only at the beginning with all of these things. The work of studying the subject has been left almost entirely to the individual makers or users of machine tools, though here and there universities and colleges have taken up this line of investigation and have helped it along. It is the great desire of the writer to see, at some time, the study of machine tools taken up in universities and technical colleges with the same amount of earnestness and thoroughness which has been devoted to the study of steam and steam engines, or of the electric motor itself. He believes that such a study will lead to surprising results.

When we consider that the work of a machine tool consists merely in removing a part of a piece of metal and when we calculate the amount of power required to remove this metal under ideal conditions, we notice that only a small fraction of 1 per cent of the total power given to a machine tool is utilized for the actual removal of the chip and that all the rest of the power applied is applied to the driving of the machine itself and to the doing of several things to the chip after it is removed; things which have no beneficial effect on the ultimate work.

Compelled Attention to Problems

It is the writer's opinion that by far the greatest effect of the electric motor on machine tools has been in the direction of bringing machine-tool problems before the eye of the machine-tool designer in a definite and tangible manner, and in having led to the first steps in the direction of investigation and collection of data. It has taken the machine tool, to a certain extent, out of the hands of the workman and has put it into the hands of the investigator. In short, it has put the machine tool business on a scientific basis. The electric motor has further increased the possibilities of machine tools by removing the limitations due to the manner of driving the machine. The conditions under which machine tools have to be operated do not permit of belts of unlimited width. The possible power which could be given to machine tools was, therefore, limited. The problem of supplying sufficient power to machine tools was brought into the foreground when high-speed steels were introduced.

The first use which machine shops made of high-speed steel was to speed up their machines, in other words, take cuts at a higher speed, leaving feeds and depth of cut much as they had been before. This was done by the simple expedient of running the line-shaft or counter-shaft at a higher speed. The machine tools, not having been designed for this higher speed, naturally caused a number of troubles. It was also found that better results could be obtained by not attempting to run the cutting speed up too high, but by increasing the feed and depth of cut. The second stage of the application of high-speed steels was almost entirely in that direction, but this required a much increased driving power for the machine tool. Various methods were employed to reach this result, such as speeding up the machine tool and then using the lower speeds almost exclusively; but even then it was found that the existing machine tools would not permanently lend themselves to the increased production. Gradually new designs of machine tools were brought out to meet the requirements of high-speed steel. The chief innovation introduced into the older types of machine tools was increased driving power, and the difficulties encountered by trying to get this increased driving power out of a belt led almost immediately to the application of the electric motor.

However, there was one item in which the driving belt had the advantage over the electric motor. The driving belt could be made shifting and thus supply the necessary changes of speeds, whereas, in the early stages of the application of the electric motor to the machine tool, there was no motor of which the speed could be properly changed. It is the opinion of the writer that the demand of machine tools led to the development of the adjustable speed electric motor. Various systems at first were used, which have now all been abandoned, such as speed control by armature resistance, the use of series-wound motors, the multiple-voltage system, and the three-wire system. They have now all been supplanted by the adjustable-speed motor with field control. The limitations to the extent of possible field control have led to the interpole motor in its various forms.

Alternating Current Motor Presents Problem

It seemed for some time that the adjustable-speed electric motor would solve the problem of speed range in a machine tool. However, the development of the alternating-current motor, which does not yet permit of speed regulations in a manner required by machine tools, made it necessary to devise other means of governing the speed of machine tools.

Economical reasons compelled machine tool builders to reduce the number of types of their machine tools. It was hardly possible to develop one type of machine tool for belt drive, another type of the same tool for a direct-current adjustable-speed motor drive, and still another type of this same tool for an alternating-current motor drive. At first, this was actually done, and the varieties of motor-driven tools were much the same as those of the belt-driven tool. They were belt-driven tools with motors attached. As a result, this attaching of a motor was in the nature of a makeshift. Various forms and types of motors were attached in various ways. Of course, this could not be a lasting condition, and it was not long before various machine-tool makers made an attempt at designing their machine tools in such a manner that they could be driven according to the needs of the user, either by belt, by alternating current motors, direct current one-speed motors, or adjustable-speed motors.

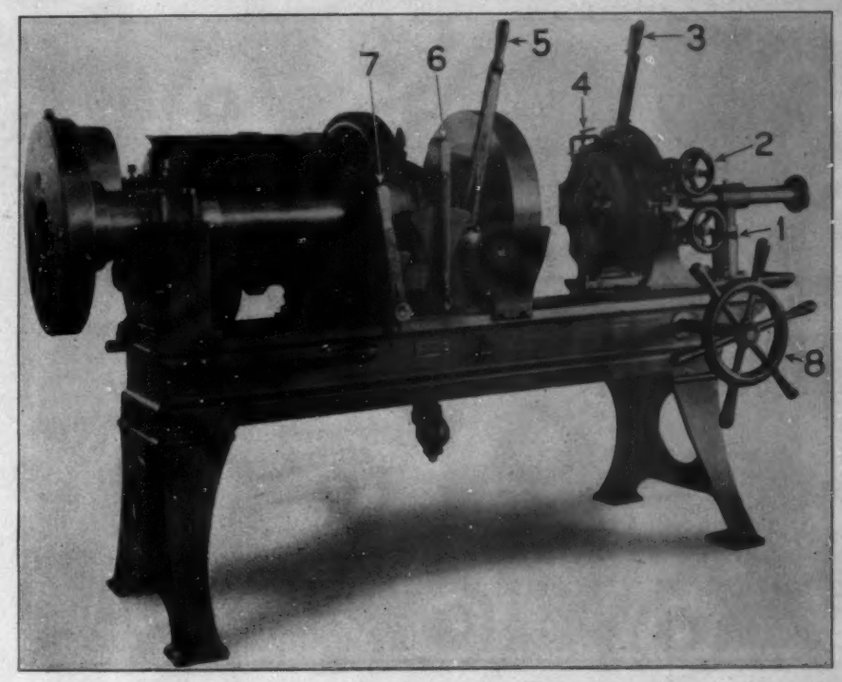
Use Motor as Driver Only

At first, the adjustment of the speed, when using an alternating-current motor, was obtained by interposing the countershaft with a belt cone, just as had been done in the original construction of the machine tool; but, gradually, all machine tools drifted into the way of using the electric motor as a driver only, and having the speed-adjusting mechanism, in the form of gear-boxes or similar devices, as a fundamental part of the machine tool. The application of mechanical speed-

(*Continued on Page* 718b.)

Convenient Control for Pipe Machine

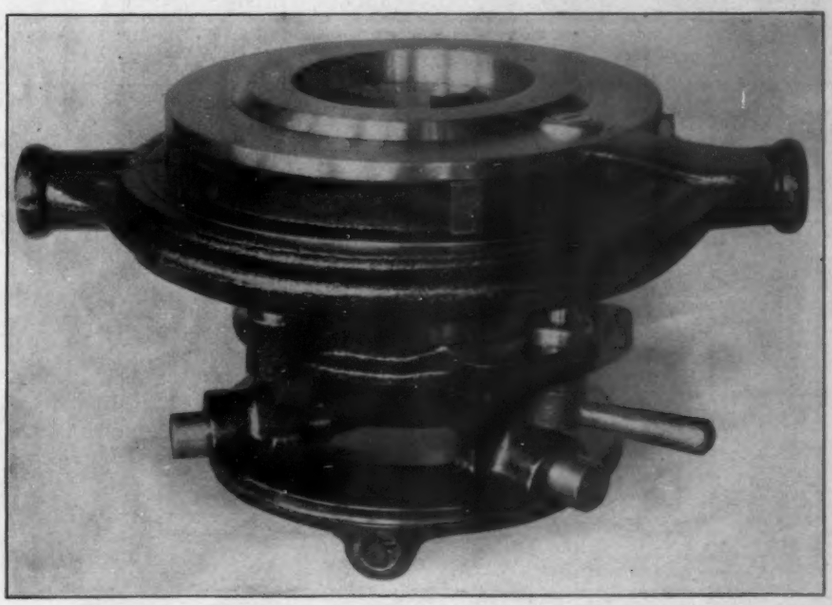
IN designing its pipe machine, the Crane Co., Chicago, gave particular attention to the location of the controlling elements. Every lever and wheel has been placed in a position that is readily accessible to the operator. This arrangement, it is said in a recent issue of *The Valve World*, gives increased production through the elimination of lost motion on the part of the workman. The accompanying illustration shows this arrangement clearly. Wheel *1* operates the pipe cutting-off tool. The jaws for steadying the pipe when cutting off are operated by wheel *2*. Lever *3* opens and closes the dies and is used for setting dies to size when threading the pipe. Cock *4* controls the supply of oil to the dies and cutting-off tool. Lever *5* opens and closes the jaws in the chuck, which hold the pipe. Lever *6* is used for changing the speed of the machine for threading different sizes of pipe. Lever *7* permits the speed of the machine to be increased when cutting off the pipe and also stops the machine. Wheel *8* moves the die-head carriage when the pipe is being threaded, the operator watching the threads and being enabled to move the carriage of the machine without the necessity of changing his position.



ARRANGEMENT OF CONTROLLING ELEMENTS OF PIPE MACHINE

Ratchet Stock of Novel Design

THE Oster Mfg. Co., Cleveland, recently has developed the die stock for 2½ to 4-inch pipe, which is shown in the accompanying illustration. In operation, the leader screw is in position to thread when the slant-post, which recedes the dies, is flush with the face of the die stock. The tool is placed on the pipe and by means of a small rod, or scrap of pipe, the universal scroll steel chuck is revolved until the gripping jaws are solid on the pipe. The chuck is strong enough to crush the pipe if sufficient power is applied and it is claimed that there is no possibility of the grip slipping. The stock then is turned and the thread is cut. A pawl is used to prevent the ratchet die stock from slipping back. By this arrangement it is claimed that the operator need set the pawl only once, and can concentrate his attention to cutting the thread. When the pipe has been threaded, the slant post has carried its spring-head above the face of the stock and the cam is free. By moving it to the left, the dies are freed from the thread. The stock is then turned back while the dies stay open so that they do not drag over the finished threads. The tool, when in use, weighs 77 pounds. Its measurement over all, without handles, is 13 inches. The distance from dies to guides is 8 inches. The stock is said to be rapid in operation.



RATCHET STOCK AND DIE

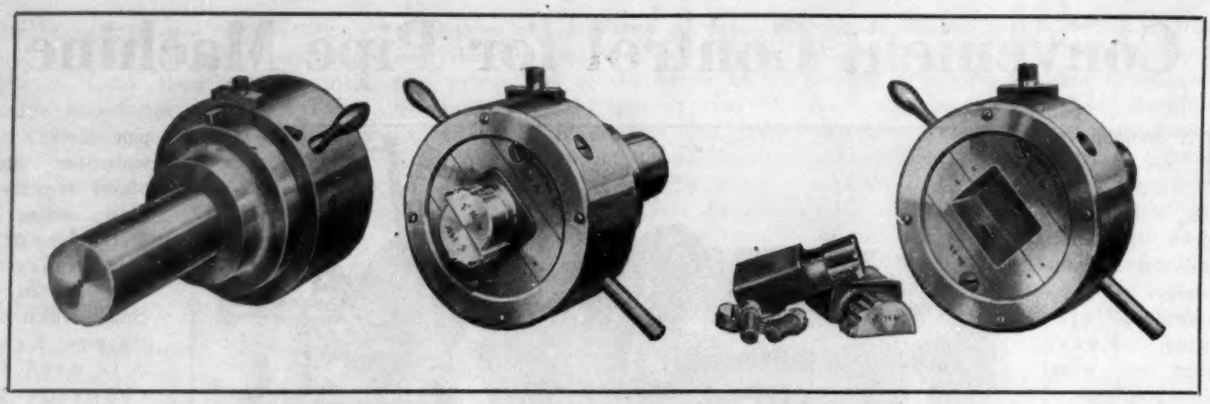


Fig. 1—Adjustable Collapsing Tap—Front and Rear Views and With Chasers Removed

Collapsible Tap of New Design

A NEW automatic collapsible tap manufactured by the Modern Tool Co., Erie, Pa., is shown in the accompanying illustrations. This tool was designed for use in conjunction with the company's self-opening die. It is said to meet all requirements of thread cutting.

The tap, which is made in four sizes, will tap holes from ½ to 3 inches in diameter. It can be applied to any type of automatic or hand screw machine where the work revolves and also can be used on live spindle machines, such as drill presses, where the work is stationary and the tap revolves.

The chasers are made in two sections, each of which is provided with two or more sets of cutting teeth. These teeth can be ground on the lip or throat, in the same manner as a solid tap. The deep grooves provide ample space for chip room and oil. The tap sections slide in opposite directions. They are held in a predetermined relation for tapping and slide in the reverse direction toward each other to collapse, thus allowing the thread already cut to be cleared when the tap is withdrawn.

The base of the tap sections is squared and is fitted in a hole in the movable blocks, 104, Fig. 2, being held with hollow head set screws. All end strain of tapping is taken by the projecting flanges on the tap sections, which rest on top of the blocks, *104*. A square key, *144*, in the base of the chasers, holds the two parts in alignment.

One of the features of this tap is the interchangeability of chasers for different diameters and pitches of thread. One head accommodates a number of sizes, permitting an unusually wide range of diameters.

The chaser blocks, *104*, are slidably mounted in a T-shaped slot in the head, *103*. Each block has a curved cam end which co-operates with the radial cam surface of ring *102*. The slots in the ring are of sufficient depth to allow the blocks, *104*, to move opposite to each other, to collapse the tap when the cam ring, *102*, is rotated, and to expand the tap when moved in the reverse direction. The shoulders at the end of the slots in the ring form a stop to limit the rotation of the cam.

When tapping, the shank, *107*, is clamped to the turret of the machine in the usual manner. By advancing the turret the tap enters the work. When the required depth is cut, the tap can be quickly collapsed by retarding the forward motion of the turret. This permits the ring and head carrying the taps to advance sufficiently to disengage the lock block, *108-A*, from the feather, *111-A*, The ring is then rotated by the springs, *135*, and the blocks, *104*, are moved outwardly by the springs, *118*.

The tap can be reset either by hand or automatically through a cam fitted to the machine and engaging a pin as the turret revolves. The springs, *117*, force the ring into its locked position ready for tapping. The pins, *142*, which are mounted in the head, *103*, engage holes in the shank head,

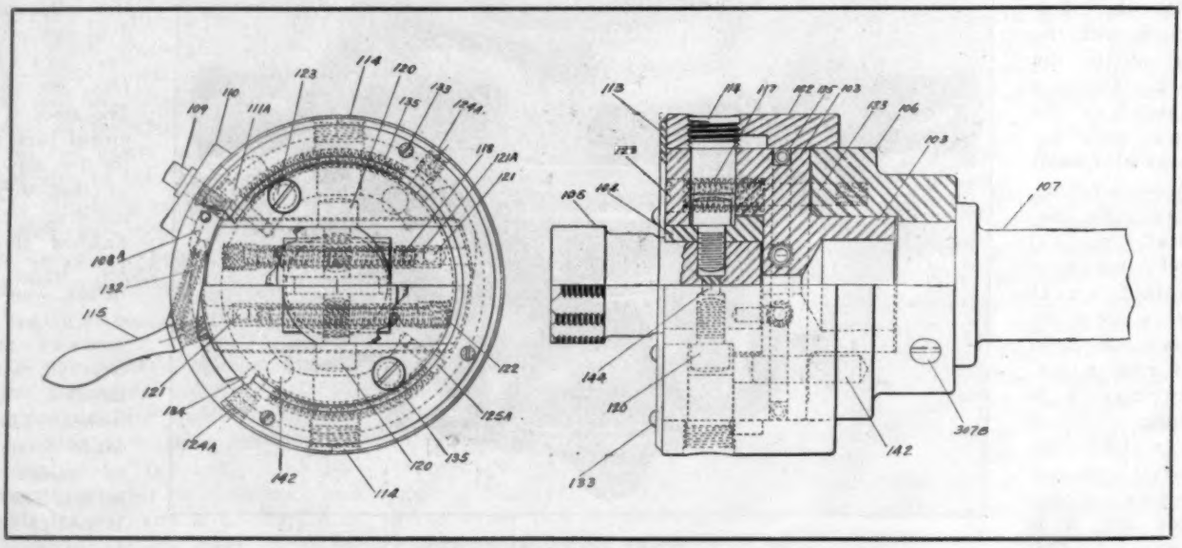


FIG. 2—CROSS SECTION OF COLLAPSIBLE TAP

106, allowing the head and ring to slide forward and unlock but preventing rotation. Adjustment for size is made by loosening the screw, *109*, and operating the screw, *132*.

These taps are being used in threading shrapnel shells to receive the timing fuse, under conditions where rapid and accurate production is of great importance.

The courses of study of Wentworth Institute, Boston, are described in a 124-page catalog recently issued by the faculty of this institution. Wentworth offers both day and evening courses for young men, including one-year apprenticeships for those who wish to become skilled workmen, and courses for persons already employed in mechanical trades or industries, and who wish later to become superior workmen, master mechanics or foremen. Among the branches of industry taught are machine work, foundry practice, forging, hardening and tempering, machine construction and tool design, foundry chemistry and management, strength and properties of materials, and electrical practice and theory.

A good way to adjust new engine main bearings is to set the boxes up tight and slack back the adjusting screws one face of the head. Then start the engine, watch it carefully and tighten up the screws gradually until the pound is all taken out.

Sparks from the Grinding Wheel

By H. O. Tair

SAID Cousin Bull to Cousin Sam,
"Lend me a pound, old dear;
I'm very well near strapped, I am,
And so is Cousin Pierre."

Said Cousin Sam to Cousin Bull,
"Before I lend it, John,
The details I must learn in full
Of what you'll spend it on."

Said Bull, "I mean to buy a cake;
Some candy Pierre demands;
And then, in case our sling-shots break,
We'll get some rubber bands."

Said Sam, "Oh, fie! I shan't supply
A loan for things like that;
For with your sling-shots you would try
To smash old Schnitzel's hat.

"And that would never do, you know:
'Twould make him vexed with me;
But still, the money I'll bestow,
If you will both agree

"To spend it all on cakes and things;
'Twill leave you that much more
To lavish on your sinful slings,
From what you had before!"

* * *

Imagine Phil Sheridan trying to stage his w. k. ride in competition with 60-mile-an-hour armored trucks and field telephones!

* * *

Germany will never be crushed until her devoted people melt up for cannon balls the cast iron dogs in their front yards.

* * *

A recent article in *The Saturday Evening Post* tells of a Belgian steel magnate "burning tar in his blast furnaces to make steel." *Post* readers among the metal trades are eagerly looking forward to a sequel, describing the manufacture of basic aluminum in an acid open hearth bessemer crucible.

* * *

A person entitled Clyde Tavenner rises to inquire—via one of the Scripps papers—why the war department pays the "armor ring" $17.50 for 3 8/10-inch shrapnel, when it can manufacture and is manufacturing the same thing itself at Frankfort, Ky., for $7.94. Someone ought to lead Clyde out to a secluded spot and tell him, as quietly and painlessly as possible, the reason. If all manufacturers could operate their plants on the "Let Sam do it" basis, without worrying over trifles like overhead costs and depreciation charges, private yachts would be as cheap as straw hats in October, and this world would be a brighter, better place to live in.

* * *

"Several tentative pipe line projects are under consideration," says a recent issue of *The Daily Iron Trade*. Sounds like a tubular hallucination.

* * *

It is the poor who suffer most by war. Platinum is now up to $40 an ounce and almost impossible to be had for jewelry.

* * *

A newspaper headline declares that "Rockefeller May Sell Colorado." It's a nice state, with lots of game and fish, and ought to fetch John D. a pretty sum.

* * *

In New England, piece work seems to be peace work.

* * *

"Finished steel"—a used shrapnel shell.

* * *

A German school has made the inventor of the 42-centimeter gun, a doctor of engineering *honoris causa*. How about granting him degrees in mining and anatomical research?

* * *

A scientist at the University of Pittsburgh says there will be a large immigration of high class labor to this country after the war. The competition in plain and fancy ditch digging will become something frightful, no doubt.

* * *

American bankers warn their clients to take terms in preference to immediate payment on foreign sales. Didn't Omar say something about taking the cash, letting the credit go, and not heeding the rumble of a distant drum?

* * *

Russian commissions are now in this country studying the latest methods of bridge building. Pretty soon they'll send over some more commissions to investigate reforestation, town-planning, and the race suicide theory.

* * *

"It is today almost possible to build a fireproof asbestos house," says an ad. Isn't it cheaper to hang the parlor matches a little higher?

* * *

Says the esteemed Cleveland *Plain Dealer*, in the leading paragraph of a recent front page story, "Fulton took a tip from his mother's boiling tea kettle and invented the steam engine." Spose'n he did, it makes one's blood boil to remember how Watt came snooping along a few decades before and stole the glory.

* * *

The equally esteemed Cleveland *Leader*, not to be outdone, chronicles the advent of a marvelous new structural material. In the description of a bridge, it recounts methods used by the builders "to avoid any alignment trouble by shifting or the effect of the temperature on the highly tempered *pickel* steel. These new vinegar soaking pit processes certainly are wonderful.

* * *

The no-whit less esteemed Birmingham *Ledger* says the Ensley steel mill is making steel bars for shrapnel, the pieces being "12 feet in length and three inches in circumference." Which would give the completed shrapnel case an outside diameter of about 0.95-inch. The U. S. government ought to commandeer the supply for use in anti-aircraft guns in the New Jersey mosquito district, or up Great Lakes way to repel next summer's invasion of Canajun soljers.

* * *

Doc Dumba was a lively guest,
In plot and counterplot immersed;
A busybody Buda pest,
He done his little Wiener worst.

* * *

Later we'll get big European orders for spikes to fasten down new frontiers.

* * *

"Advances on barbed wire have been noted," says the market report, corroborated by news from the front.

Foundrymen Put in a Busy Week

Allied Conventions of American Foundrymen's Association and Institute of Metals Attract Large Attendance—Interesting and Instructive Program

IN POINT of attendance and tangible results, the recent convention of the allied foundry organizations at Atlantic City will long remain notable in the annals of the casting industry. The official registration of the American Foundrymen's Association and the American Institute of Metals eclipsed all previous records, reaching a combined total of 884. In three days the two societies held 12 professional sessions, at which 64 papers and reports were received. This involved a large amount of work, but in addition definite action was taken on a number of important proposals, particularly by the American Foundrymen's Association. This organization decided to take steps at an early date looking toward the employment of a cost expert to assist in the establishment of a uniform cost system in the shops of its members. The committee on steel foundry standards was instructed to proceed with the standardization of ladle stoppers and the suggestions of the committee on industrial education were received with interest. Also a committee was appointed to co-operate with the U. S. bureau of standards.

The Institute of Metals took action on several subjects, the details of which will be found in a separate report elsewhere in this issue, covering the proceedings of this organization. The following paragraphs deal exclusively with the activities of the American Foundrymen's Association, a complete, illustrated description of the Foundry and Machine Exhibition on Young's Million Dollar Pier having been presented in the Sept. 30 issue of *The Iron Trade Review.*

With the officers of both associations presiding, the opening joint session was held in the beautifully decorated Greek Temple on Young's Million Dollar Pier. The attendance was unusually gratifying. R. A. Bull, president of the American Foundrymen's Association, acted as chairman. Henry A. Carpenter, General Fire Extinguisher Co., Providence, R. I., a vice president of the American Foundrymen's Association, delivered the address of welcome on behalf of the local committee of eastern foundrymen, of which he was a member. Mr. Carpenter commented on the prosperous condition of the foundry industry and expressed the opinion that 1916 would prove a banner year. Pig iron prices, he explained, are ascending and the foundry industry always enjoys prosperity when pig iron is high. He also commented upon the recent advances in the world of science, including transcontinental telephony, which has now become an established fact. He pointed out that organizations such as the American Foundrymen's Association and the American Institute of Metals are as helpful in binding the business community together as the wonderful means of communication which we now have at hand.

J. P. Pero, Missouri Malleable Iron Co., East St. Louis, Ill., also one of the vice presidents of the American Foundrymen's Association, responded to the address of welcome in an appropriate manner.

Major Joseph T. Speer, Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, past president of the A. F. A., moved the appointment of a committee to draft appropriate resolutions on the deaths of Thomas D. West and E. H. Mumford. He suggested that the committee consist of Dr. Richard Moldenke, chairman; Thomas Devlin, Philadelphia, and Paul Kreutzpointner, Altoona, Pa. Major Speer's motion was passed unanimously.

The convention then turned to the technical portion of the program, which was opened with the report of the A. F. A. committee on safety and sanitation. In the absence of A. W. Gregg, Bucyrus Co., South Milwaukee, Wis., chairman of the committee, the report was presented by the secretary. It suggested that the American Foundrymen's Association issue occasional safety bulletins and also recommended the publication of a special bulletin in memory of Thomas D. West, whose colossal work on safety and sanitation will always remain a landmark in foundry history.

Modern Industrial Education

Prof. Frank M. Leavitt, University of Chicago, presented the report of the committee on industrial education. Prof. Leavitt spoke extemporaneously, emphasizing the need for closer co-operation between business men and school boards in order that suitable industrial training may be provided in the public schools for those in the humbler walks of life, as well as for leaders.

The committee's suggestions developed considerable discussion. Major Joseph T. Speer outlined the work of Carnegie Institute, Pittsburgh, in industrial education with particular reference to the institute's foundry courses. J. S. Seaman, Seaman-Sleeth Co., Pittsburgh, told how industrial education had assisted one of the young men in his employ to rise from a position of laborer to chemist in a comparatively short time. During the time he was attending school this young man worked all day in the foundry, then walked about three miles to his home and after supper walked five miles further to the institute. Dr. Richard Moldenke, in referring to the specific recommendations of the committee, suggested that the best results cannot be expected unless the school men are given a definite program of industrial education by the business interests. Benjamin D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland, described the work of the technical high schools of Cleveland and also stated that it is the plan of the board of education eventually to separate pupils, according to vocations, beginning with the sixth grade. W. H. Barr, Lumen Bearing Co., Buffalo, president of the National Founders' Association, outlined the work of the conference board on the training of apprentices and extended an invitation to the allied foundry organizations to co-operate in this work.

"Tests of Lenses for Foundry Goggles" was the title of an exceedingly interesting paper presented by F. W. King, Julius King Optical Co., New York. This paper included a copy of the recent laboratory standard for the examination and testing of goggles with plain uncolored lenses, developed by the Underwriters' Laboratories, Inc., Chicago, under the direction of the National Board of Underwriters. Mr. King's address was accompanied by a demonstration of the lens testing machine and a

colored spectroscopic lantern test showing, scientifically, colors of lenses used in dangerous conditions of light and glare. Various types of goggles were exhibited and explained, including colored glasses designed to exclude the ultra-violet rays given off by incandescent metal and by the electric arc.

A paper by H. M. Lane, foundry engineer, Trussed Concrete building, Detroit, entitled "Functions of Sand Binders", was read in abstract. After explaining the purpose of sand binders in foundry operations, this paper presents a classification of such binders, dividing them into soluble binders, paste binders, colloids and allied bodies, including gums, pitches and oils. It is pointed out that the first two classes are subject to moisture, but the colloid bodies may or may not be subject to injury from moisture, while the gums and pitches, as a rule, are water-resisting or waterproof. The paper discusses the binding power of these various materials in detail and included much valuable information on the adaptability of binders for cores for various classes of work.

A preliminary report on molding sands was presented by C. P. Karr, associate physicist, bureau of standards, Washington, D. C.

This report evoked considerable discussion, which was opened by Dr. Moldenke, who suggested that the bureau of standards examine the previous work of the American Foundrymen's Association on molding sands. In this connection Dr. Moldenke graciously offered to contribute numerous samples of sands in his possession to the bureau for its experimental work. H. E. Field, president, Wheeling Mold & Foundry Co., Wheeling, W. Va., referred to Dr. Moldenke's exhaustive work on molding sands and suggested that the American Foundrymen's Association should arrange to co-operate actively with the bureau of standards in the investigation which it is undertaking. W. M. Corse, Titanium Alloy Mfg. Co., Niagara Falls, secretary of the Institute of Metals, explained the work of a committee representing various national technical societies which meets with the bureau of standards twice a year for the consideration of suitable lines of investigation. Mr. Corse recommended that the American Foundrymen's Association should join with the activities of this committee. Mr. Field backed up this suggestion by moving the appointment of a committee to co-operate with the bureau of standards, suggesting that Dr. Richard Moldenke be the chairman. This motion was passed unanimously and President Bull accorded Dr. Moldenke the privilege of naming his own committee.

A paper on "Albany Molding Sand", by D. H. Newland, associate state geologist, Albany, N. Y., was accompanied by interesting lantern slides, showing methods of extracting, grading and shipping Albany sand, together with micro-photographs showing the characteristics of the sand in detail.

Bond Test Considered

R. F. Harrington, Hunt-Spiller Mfg. Co., Boston, opened a discussion by asking if the producers could not adopt some method of grading the sand more accurately It was the sense of the meeting that progress could be made in this direction and considerable discussion of the dye bond test ensued. It was pointed out that the bond test is particularly useful in controlling the quality of heap sand, to be sure that it will at all times be in condition to produce the highest grade of castings. When the bond test shows that the sand is wearing out, economic considerations must determine whether it is best to attempt to restore the old sand by adding clay, etc., or to throw the old sand away and replace it with new material. This paper also was discussed briefly by J. J. Wilson, Cadillac Motor Car Co., Detroit, and by E. M. Ayers, Interstate Sand Co., Zanesville, O.

R. A. Bull, manager of production, Commonwealth Steel Co., Granite City, Ill., presented a paper entitled "Notes on Applications and Characteristics of Cores in Modern Molding". Mr. Bull defined the term "core" and discussed

THREE PRESIDENTS ON THE ROSTRUM

From left to right:—G. H. Clamer, president, American Institute of Metals; R. A. Bull, president, American Foundrymen's Association and W. H. Barr, president, National Founders' Association

the use of cores in molding operations at considerable length.

At the conclusion of the Tuesday morning session the nominating committee and committee on resolutions were appointed. The former consisted of J. S. Seaman, chairman, Joseph T. Speer, L. L. Anthes, Alfred E. Howell and Henry A. Carpenter. The resolutions committee included Benjamin D. Fuller, chairman, Joseph J. Wilson and W. B. Robinson.

The Tuesday afternoon session was characterized by several excellent papers on molding machine practice and scientific management. "Patternmaking for Molding Machine Work", was the title of a paper read by E. I. Chase, Cadillac Motor Car Co., Detroit.

E. S. Carman, Osborn Mfg. Co., Cleveland, presented a large number of lantern slides with his paper on "Foundations for Jar-Ramming Molding Machines". The slides showed the construction and characteristics of various foundations in detail.

In discussing the paper, S. D. Sleeth, Westinghouse Air Brake Co., Wilmerding, Pa., stated that he had observed difficulties, occasionally, on account of ground vibration, which shook out molds 30 feet or more away from the jarring machine. In order to eliminate this vibration it was necessary to extend the foundation down to gravel at a depth of 12 feet. The author replied that ground vibrations can be eliminated if the machine is constructed to properly cushion the blows.

An exhaustive paper on "The History and Development of the Molding Machine with Sidelights on Latter-Day Practice", by J. J. Wilson, Cadillac Motor Car Co., Detroit, and A. O. Backert, Penton Publishing Co., Cleveland, was presented by the former.

The paper was accompanied by 81 lantern slides, showing molding machines in great variety and in actual operation. In answer to a question, E. S. Carman explained that hydraulic molding machines are not utilized in the United States as extensively as they are in Europe, because American foundries are provided with other sources of power, chiefly compressed air and electricity.

In a paper entitled "Scientific Management and Its Relation to the Foundry Industry", by H. K. Hathaway, Tabor Mfg. Co., Philadelphia, the purposes and accomplishments of scientific management were explained.

W. M. Saunders and H. B. Hanley, consulting chemists, Providence, R. I., presented a paper on "Reclaiming Molding Sand", which discussed a method of reclamation by restoring the bond with clay.

S. V. Blair, Rushville, Ind., former president of the Associated Foundry Foreman, was not able to be present and his paper entitled "The Relation of the Foundry Foreman to His Employer", was read by the secretary

The report of the committee on specifications for foundry scrap was presented by its chairman, S. D. Sleeth, Westinghouse Air Brake Co., Wilmerding, Pa. The report was accepted and a motion passed to continue the committee for further investigation. Dr. Moldenke suggested that the specifications should include stove plate scrap and pointed out the necessity of eliminating burnt grate bars.

J. P. PERO, SENIOR VICE PRESIDENT, A. F. A.

At the Wednesday morning session Dr. Richard Moldenke, Wachtung, N. J., read an exceedingly interesting paper covering the history of the foundry from earliest times, dealing particularly with the tremendous advances of the past 25 years. In presenting his paper, Dr. Moldenke spoke extemporaneously and suggested that the American foundries might advantageously adopt the European plan of installing several small cupolas in place of one large one. The small cupolas, he explained, enable the foundryman to run several different mixtures simultaneously, thus giving him a more accurate control of the quality of his product. Benjamin D. Fuller endorsed the suggestion advanced by Dr. Moldenke.

Tendencies in the purchase and sale of pig iron for the manufacture of castings were discussed in an interesting paper by Oliver J. Abell, western editor of *The Iron Age*, Chicago.

The report of the committee on costs, which was presented by the chairman, Benjamin D. Fuller, Westinghouse Electric Mfg. Co., Cleveland, evoked considerable discussion. The abstract of this report follows:

The adoption of a uniform basis of figuring costs by foundrymen generally is recommended. The factors constituting this uniform basis follow:

1.—The commodity sold by a foundry is the labor of the molder and coremaker and not the material entering into the product.

2.—The material is more or less a constant, varying with market conditions.

3.—Cost of production fluctuates in proportion to pounds of output per molder.

4.—Overhead charges increase or decrease, according to pounds of output per molder.

These various factors are discussed in detail and an interesting method of figuring the overhead is presented. The work is divided into two classes, namely, slow-moving and fast-moving, and it is stated that slow-moving jobs should carry a higher percentage of overhead than fast-moving jobs. Examples are cited which prove conclusively the correctness of this theory. Simple instructions are given for arriving at the proper cost. To promote the adoption of a uniform method of keeping costs, the committee recommends that 100 foundrymen guarantee a fund by the payment of $50 each, or 50 foundrymen guarantee to pay $100 each, during the period of one year. Each of these foundrymen then would have first call on the services of this cost expert and during the year he could remain at each of their plants a sufficient time to teach the accountants the basis or theory of the system recommended. Also, it is suggested that general meetings be held in the various localities visited by the cost accountant during the year and the system then could be further explained to interest foundrymen generally in the adoption of the uniform cost theory.

In a written discussion, C. D. Segner, Domestic Engine & Pump Co., Shippensburg, Pa., stated that in his opinion the overhead charges bear a closer relation to tonnage produced than to hours of molding labor. In this system the overhead is properly proportioned between the fast and slow-moving jobs by dividing the work into two classes, placing the intricate castings in one class and the plainer work in the other. The overhead for the intricate work was stated to be $1.10 per 100 pounds, that for the plain work being 96 cents. Mr. Fuller, in commenting on Mr. Segner's discussion, stated that the Westinghouse company formerly appor-

tioned its overhead charges to tonnage of castings produced, but since discovered that this method is incorrect. The Westinghouse company now distributes its overhead on a mixed basis according both to tonnage and labor, although the large majority of the charges are distributed according to hours of labor rather than according to tonnage.

The paper was also discussed by H. E. Field, Wheeling Mold & Foundry Co., Wheeling, W. Va., who suggested that the American Foundrymen's Association adopt the recommendation of the cost committee and employ a cost expert to assist in the establishment of a uniform cost system in the shops of its members. Upon a motion by the secretary, Mr. Field's suggestion was unanimously adopted.

An exceedingly interesting paper entitled "Organization in the Foundry of the University of Illinois Shop Laboratories", was presented by R. E. Kennedy, joint author with J. H. Hogue. This paper, which was published in full in last week's issue, was accompanied by numerous lantern slides showing the equipment and methods of the University of Illinois foundry.

Corrosion Tests Unreliable

"Structural or Mechanical Theory of the Effect of Rust on Cast Iron, Wrought Iron and Steel", was presented by R. C. McWane, publisher of *Fire Engineer*, and H. Y. Carson, Central Foundry Co., New York.

The discussion of this paper brought out the almost unanimous opinion that accelerated corrosion tests are unreliable as a measure of the rust-resisting qualities of various metals. Dr. Moldenke pointed out that cast iron pipes lose comparatively little weight by rust, stating that the greatest danger arises from the presence of stray electric currents in the ground, resulting in electrolysis. J. H. Holmgreen, Alamo Iron Works, San Antonio, Tex., asked if semi-steel has better corrosion-resisting powers than cast iron. Dr. Moldenke expressed the opinion that it has, on account of its being less porous. Bradley Stoughton, consulting metallurgical engineer, New York, said he believed the corrosion-resisting powers of cast iron are due to the skin formed on castings by the action of the sand, etc., in the mold. A. O. Backert, secretary of the American Foundrymen's Association, described tests conducted by Edgar Allen Custer, Philadelphia, on soil pipe cast in permanent molds. This pipe, owing to its thick skin, resisted corrosion better than sand cast pipe, thus bearing out Mr. Stoughton's contention. Mr. Backert suggested that an investigation of the effect of sand blasting on this skin would be interesting. Dr. Moldenke described experiments to show the effect of hot hydrofluoric acid on white malleable iron. He stated that a 1 to 30 solution had practically no effect on pieces which were immersed for three months. This paper also was discussed by R. F. Harrington, Hunt-Spiller Mfg. Co., Boston, and by Ira B. Lesh, Railway Materials Co., Chicago. Mr. Lesh pointed out that car wheel treads do not rust or corrode as rapidly as the body of the wheels.

Oil Fired Cupola

The afternoon session, Wednesday, Sept. 29, was devoted exclusively to gray iron foundry practice. Bradley Stoughton, consulting metallurgical engineer, New York, described the interesting oil-fired cupola which he has developed.

ON THE BOARDWALK
Dr. Moldenke on the Left

Mr. Stoughton presented a large sectional drawing of the cupola, illustrating its construction in detail. The design, he said, includes four ignition chambers, each of which is fitted with one oil burner to which oil and air are supplied at a pressure of from 12 ounces to 5 pounds per square inch. Volume air also is supplied to the ignition chambers at a pressure of 18 ounces to the square inch. Coke is used in the oil-fired cupola as in ordinary practice, except that the quantities burned are greatly reduced. The results of industrial operation seem to indicate that melting with oil is somewhat faster than melting with coke, although further experiments will be necessary to establish this fact thoroughly. The best results obtained so far indicate that hot iron may be obtained by the use of 60 pounds of coke and 7.2 gallons of oil per ton of iron melted. This amount of coke does not include the bed. In a comparative test made by Dr. Moldenke it was found that iron which, when melted with coke, contained 0.080 per cent sulphur, when melted in the oil cupola contained 0.045 per cent sulphur. Another test showed that the iron increased from 0.032 per cent sulphur to 0.045 per cent, an increase of 0.013 per cent in an oil cupola melting 50 per cent of its own scrap. Crude oil, because it is cheaper and of higher heating value than fuel oil, is preferred. It is more viscous than fuel oil, however, and must be preheated by some simple means, using steam, gas or electricity.

A. F. Blackwood, Michigan Steel Castings Co., Detroit, asked the author why any coke was used in the cupola at all. He suggested that silica brick might be employed if an incandescent material were necessary. The author replied that silica brick would soften and slag together at the temperatures existing in the cupola and that the coke contributed to the efficient combustion of the oil. He also pointed out that previous experiments attempting to melt iron with oil without the use of coke had been failures. The ash question also was discussed and Mr. Stoughton explained that since only a quarter as much coke was burned as usual, the volume of slag was considerably reduced. J. H. Holmgreen, Alamo Iron Works, San Antonio, Tex., asked if there was any saving in the power required to furnish the blast. The author replied that definite data on this point were unavailable, but that the same blowers were being used as when melting entirely with coke. In reply to a quesion by Edward Dithridge, J. L. Mott Co., Trenton, N. J., the author stated that heats had been melted ranging from 100 per cent pig iron to 100 per cent steel scrap and that long runs were made on a mixture approximating 50 per cent pig and 50 per cent scrap. Ira B. Lesh, Railway Materials Co., Chicago, questioned the success of the heats containing nothing but steel scrap and the author admitted that difficulty was met with in melting this material. He stated that on one trial the cupola had to be shut down after melting about 1,000 pounds and on another after melting a ton, owing, however, to lining troubles, which he believed could be overcome. There was less than 2 per cent total carbon in the metal poured, when melting 100 per cent steel.

Inspection of Castings

"The Inspection of Automobile Castings", was the title of a paper submitted by C. B. Wilson, Wilson Foundry & Machine Co., Pontiac, Mich.

In reply to a question the author stated that it required about six months to properly train the inspector. Another speaker described a system of bulletins issued in his shop covering

errors. The bulletin file contains a record of the experiences of the shop and is particularly useful to new men. George E. Jones, Whiting Foundry Equipment Co., Harvey, Ill., described a similar bulletin system.

In a paper on "Defects Common to Gray Iron Castings—Their Causes and Remedies", by Herbert M. Ramp, Elmwood Castings Co., Cincinnati, the statement was made that approximately 5 per cent of the iron castings produced are defective and the causes assigned for these losses were proportioned as follows: Sand and its treatment, 50 per cent; cores, 20 per cent; patterns, 10 per cent; equipment, 5 per cent, and iron, 5 per cent.

A paper entitled "Pouring Systems for Gray Iron Foundries", by H. Cole Estep, engineering editor of *The Iron Trade Review, Cleveland,* was accompanied by a number of interesting lantern slides.

The committee on specifications for gray iron castings recommended that the American Foundrymen's Association take a more active part in the preparation of specifications than has been the case in the past. The appointment of sub-committees to act in conjunction with the general committee was suggested. These sub-committees, it was stated, should formulate specifications for the following classes of castings: Car wheel, pipe, agricultural, steam engine and hydraulic cylinders and chemical. The committee also recommended for adoption the tentative methods proposed for sampling and analysis of pig and cast iron, presented for consideration to the American Society for Testing materials at its last meeting.

W. D. Putnam, Detroit Testing Laboratory, Detroit, chairman of the committee, who presented the report, made some informal remarks on hardness tests, discussing the various methods for determining the hardness of cast iron and other ferrous metals. Mr. Putnam also demonstrated the operation of the Brinell and Shore hardness testing machines. Considerable discussion ensued regarding the value of hardness tests of cast iron, the concensus of opinion being that this metal contains constituents which tend to make the accurate determination of its hardness difficult. The report of the committee was accepted and referred to the executive board. The report of the committee on standard methods for analyzing coke was presented by its chairman, H. E. Diller, General Electric Co., Erie, Pa.

At the steel sessions on Thursday, Sept. 30, six interesting papers and two reports were presented. Three of these papers and one report were published in full in last week's issue. These are: "Dynamic Properties of Steel Employed in the Manufacture of Castings of Various Types", by J. Lloyd Uhler, Union Steel Casting Co., Pittsburgh, Pa.; "Open Hearth Furnace Checker Design", by W. A. Janssen, Bettendorf Co., Davenport, Ia.; "Causes of Shrinkage Cracks in Steel Castings", by William R. Bossinger, Marion Steam Shovel Co., Marion, O., and the report of the committee on steel foundry standards, by Dudley Shoemaker, chairman, and R. A. Bull, supervisor of basic atomization tests, Commonwealth Steel Co.

A paper by James H. Gray, United States Steel Corporation, New York, entitled "Notes on Electric Furnace Construction and Operation in the Steel Foundry", is abstracted as follows:

As a simple competitor of coal or gas in furnishing heat for steel-making processes, electricity is expensive. The electric furnace, however, furnishes a means of producing steel under conditions free from the contamination of oxides and therefore makes possible chemical reactions and metallurgical operations that cannot be realized by the older methods. There are two general types of electric furnaces. In the arc type the heat is applied by an arc or arcs playing into or above the bath, and in this type of furnace the slag is hotter than the molten metal beneath it. In the induction type, the electric current is induced in the bath of metal itself.

After stating that the development of the induction furnace is a task for electrical experts, the author describes the details of modern arc type furnaces, giving special consideration to the hearth and lining the electrodes and their control, the transformers, power factors, and tilting mechanism. The advantages of the electric furnace for foundry use are pointed out and it is stated that the electric process is now being used to refine cupola iron for the manufacture of malleable castings.

S. T. WELLMAN AND SON ENJOYING THE SEA BREEZE

C. S. Koch, Fort Pitt Steel Castings Co., McKeesport, Pa., presented an interesting paper entitled "The Particular Application of the Converter in the Manufacture of Steel Castings", and Robert E. Kinkead, Lincoln Electric Co., Cleveland, read a paper on "The Electric Arc in the Foundry". The report of the committee on specifications for steel castings, by W. C. Hamilton, chairman, American Steel Foundries, Granite City, Ill., was also presented at the steel session.

In the discussion of Mr. Uhler's paper on the dynamic properties of steel castings, the chairman, R. A. Bull, pointed out the lack of uniformity in the results of fatigue tests, which the author explained was due to the heat generated by the testing machine, the pieces attaining a temperature as high as 140 degrees Fahr. Bradley Stoughton expressed the opinion that vibratory tests are more useful in determining the correctness of heat-treating than the ordinary tension, transverse and compression tests.

The discussion of Mr. Koch's paper brought up the question of the converter versus the small open hearth. W. A. Janssen, Bettendorf Co., Davenport, Ia., stated that converter failures are due frequently to the efforts of inexperienced gray iron foundrymen in making steel castings. The converter, he stated, should not be considered simply as secondary to cupola melting. C. R. Messenger, Sivyer Steel Casting Co., Milwaukee, stated that the converter foundry can successfully compete with open hearth shops on small work because the open hearth foundries cannot handle this class of castings economically in their cleaning and finishing departments, although they may be able to melt the metal and make the molds

economically. Mr. Janssen expressed the opinion that in general an open hearth foundry can run as thin sections as a converter plant and on a favorable cost basis. Dudley Shoemaker confirmed Mr. Janssen's remarks, stating that his experience of six years in operating an open-hearth shop on light castings indicated that almost any class of work could be handled economically. It is largely a matter of temperature, he stated, claiming it to be possible to get any required temperature in the open hearth furnace. To handle light work successfully, however, the open hearth foundry should specialize and not attempt to run heavy and light castings at the same time. Bradley Stoughton pointed out that one of the reasons for the failure of companies employing the converter process is that it is possible to go into the manufacture of converter steel castings with comparatively limited capital. Frequently, he stated, concerns go into the converter business without sufficient financial resources and the resulting failure is due in no way to the metallurgical problems encountered.

The Electric Furnace

The discussion of Mr. Gray's able paper on the electric furnace brought out the fact that one of its chief possibilities lies in its ability to use miscellaneous raw materials of moderate price. The higher elastic ratio of electric steel also was commented upon, Dudley Shoemaker stating that tests made under his observation showed an elastic ratio of over 50 per cent, using Johnson's method of measuring the elastic limit. Upon the suggestion of H. E. Field, president, Wheeling Mold & Foundry Co., Wheeling, W. Va., a vote of thanks was extended Mr. Gray for his able exposition of his subject.

The report of the committee on specifications for steel castings was accompanied by written arguments in support of the changes suggested by the committee. H. E. Field moved that the report of the committee be laid on the table, stating that in his opinion more harm than good would be done to the foundry industry if the question of specifications for steel castings be reopened. The chairman, Mr. Bull, stated that in his opinion the suggestion of Mr. Field was ill-advised, pointing out the desirability of co-operation between the American Foundrymen's Association and the American Society for Testing Materials in regard to specifications. When put to vote, Mr. Field's motion was sustained and the report was laid on the table. At the business session the following day, however, a motion to give the committee's report further consideration was passed unanimously. This same motion also recommended the acceptance of the report and directed that the committee be continued.

In the discussion growing out of the report of the committee on steel foundry standards, reference was made to the standard specifications for ladle nozzles adopted at the 1914 convention. Mr. Shoemaker, the chairman of the committee, stated that out of 65 foundries using nozzles to whom inquiries were sent, 40 agreed to either adopt or try out the A. F. A. standard. W. A. Janssen recommended the standard nozzle very highly. It was also pointed out that the adoption of a standard had had the effect of stimulating the brick makers in turning out a product of higher quality. Upon the suggestion of the chairman, Mr. Bull, a motion was presented by Mr. Janssen to the effect that the committee be continued and instructed to investigate the standardization of ladle stoppers. This motion was passed unanimously.

SAM JOHNSTON AND A GROUP OF FRIENDS TALKING IT OVER

Malleable Session

The meeting devoted to malleable casting practice was unusually well attended, six papers having been presented for the members' consideration. L. E. Gilmore, Baltimore Malleable & Steel Co., Baltimore, Md., presented a paper entitled "An Outline to Illustrate the Inter-Dependent Relationship of the Variable Factors in Malleable Iron Practice".

In this paper various types of furnaces used for producing malleable iron are considered and it is stated, that not only the type of furnace has a predominating influence on its operation, but details of construction, which may be varied, place limitations on the methods of operation. It is pointed out that not only the nature, but also the quality of the fuel greatly affects the furnace operation. Another factor of importance is the nature and condition of the slag, and control of combustion is another item of importance. The author defines an ideal mixture as one which will produce, under the conditions of furnace operations, the desired composition of melted iron as soon as it is hot enough for pouring. The physical condition of the scrap and pig also is a variable that has an important bearing upon the use of these materials. The essentials of the annealing operation are discussed, and the author states in conclusion that the successful and economical production of the best quality of malleable iron is impossible without a comprehensive grasp of the fundamental principles underlying the actions and reactions of the various factors of its manufacture. Without such knowledge, only by chance will good quality be attained.

In discussing the various types of furnaces and melting processes, Mr. Gilmore referred to the duplex process and he was asked to what extent duplexing is practiced in malleable foundries in this country or abroad and whether or not the air furnace and the electric furnace had been considered as a unit for the melting and subsequent refining of the metal. In reply it was stated that numerous experiments are being made in various plants throughout the United States with electric furnaces for melting malleable iron, but no information was given regarding the success attained. It was pointed out that the electric furnace undoubtedly may be used for refining and it was added that

metal from a Heroult electric furnace was so quiet and absolutely dead that it seemed impossible to satisfactorily pour castings therefrom. It was suggested that undoubtedly cupola melted malleable could be refined to advantage in an electric furnace.

The question of the relative advahtages of coke and charcoal pig in malleable practice also was discussed as a result of a statement made by Mr. Gilmore, that with charcoal pig it is possible to carry a higher percentage of scrap than when using coke pig iron. It was the opinion, however, of one of the speakers, that equally as good results could be obtained from the use of coke pig iron. In reply to an inquiry regarding the speed of melting and fuel

DR. AND MRS. MOLDENKE ENJOYING THE BOARDWALK

consumption employing sand and chilled cast pig iron, it was stated that heats could be made much more rapidly with chill cast pig iron than with sand cast and it was estimated that the time of melting was reduced from 10 to 15 per cent, also the saving in fuel is considerable.

"Standardization of Air Furnace Practice", was the subject of a paper prepared by A. L. Pollard, Johnston Harvester Co., Batavia, N. Y. In the ensuing discussion, the question was asked, what advantages accrue from the application of forced draft to air furnaces. In reply to this inquiry it was stated that heats which ordinarily require eight hours for melting in natural draft furnaces, can be made in from four to six hours in forced draft furnaces with only a slight increase in fuel consumption; in other words, the melting ratio in natural draft furnaces varies from 1:2 to 1:2½, whereas in forced draft furnaces the melting ratio is from 1:2 to 1:3. It was the consensus of opinion that the forced draft furnace is more satisfactory in every way in malleable practice. The use of insulating brick in air furnaces also was discussed, but none of the malleable manufacturers in attendance had yet tried insulating brick between the shell and the inner lining. One foundryman, who operates air furnaces for melting gray iron, stated that in a new furnace that he is now building 4-inch insulating brick is being installed; the lining is 17½ inches thick, with the refractory portion 13½ inches in thickness.

The committee on standard specifications for malleable iron castings presented the specifications which already had been adopted by the American Society for Testing Materials and after some discussion they were approved with the recommendation that during the ensuing year the committee on malleable standards of the American Foundrymen's Association consider the preparation of specific standards applying to various classes of work including castings for agricultural implements, chains, etc., as well as railroad work. J. P. Pero, Missouri Malleable Iron Co., East St. Louis, Ill., who presided at the malleable meeting, regretted that the limit in tensile strength had been reduced from 40,000 to 38,000 pounds per square inch. It was explained that inasmuch as the elongation had been practically doubled, it was decided to reduce the tensile strength to compensate for this increase. The establishment of uniform specifications was urged which would compel all purchasers to buy on the same basis, and it was stated that the adoption of specific standards for various classes of work undoubtedly would result in early recognition of the standard specifications for malleable castings.

Enrique Touceda, metallurgical engineer, Albany, N. Y., presented, in abstract, the results of his recent investigations into the permissable phosphorus limit in malleable iron castings. This paper was published in last week's issue. In answer to a question regarding the carbon and silicon contents when the phosphorus is increased, he stated that this increase could be made regardless of the variation in silicon and carbon. L. E. Gilmore inquired regarding the effect of an increase of 0.10 per cent in phosphorus with particular reference to the effect on the fluidity of the metal. Mr. Pero stated that it would be difficult to ascertain the results of an increase of so small an amount of phosphorus in a test, although he was certain that the fluidity would be considerably increased as evidenced by the reduced losses from misruns in his plant as a result of increasing the phosphorus for light work from 0.17 to 0.28 per cent. However, there is no appreciable change in the strength of the iron due to increasing the phosphorus to 0.28 per cent and the wedge-test results are practically the same as when melting a mixture containing 0.17 per cent phosphorus.

The sentiments expressed in the paper prepared jointly by J. P. Pero and F. E. Nulsen, of the Missouri Malleable Iron Co., with reference to a production of the highest possible quality of malleable iron, were applauded.

In the absence of F. Van O'Linda, Consolidation Coal Co., Chicago, his paper entiled "Coal—Its Origin and Use in the Air Furnace", was read by title.

Annual Business Meeting

Two business sessions were held, one Wednesday evening, Sept. 29, at which the annual election of officers took place and the other Friday morning, Oct. 1. Aside from the election, the principal feature of the annual business session Wednesday evening was the annual address of the president, R. A. Bull, which was presented in last week's issue. The reports of the secretary-treasurer and the executive board also were presented and approved.

The nominating committee's recommendations were accepted unanimously and the following officers were elected for the ensuing year: President, R. A. Bull, Commonwealth Steel Co., Granite City, Ill.; senior vice president, J. P. Pero, Missouri Malleable Iron Co., East

St. Louis, Ill.; vice presidents, Henry A. Carpenter, General Fire Extinguisher Co., Providence, R. I.; S. B. Chadsey, Massey-Harris Co., Ltd., Toronto, Can.; Alex T. Drysdale, United States Cast Iron Pipe & Foundry Co., Burlington, N. J.; H. E. Field, Wheeling Mold & Foundry Co., Wheeling, W. Va.; Benjamin D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland; W. A. Janssen, Bettendorf Co., Davenport, Ia.; H. B. Swan, Cadillac Motor Car Co., Detroit; A. H. Thomas, Buckeye Steel Castings Co., Columbus, O., and Walter Wood, R. D. Wood Co., Philadelphia. Secretary-treasurer, A. O. Backert, also was re-elected. A resolution was passed unanimously increasing the secretary-treasurer's salary from $1,200 to $1,800 per year.

Upon motion of J. S. Seaman, the venerable dean of the American Foundrymen's Association, R. A. Bull, who was re-elected president, was unanimously elected an honorary member. W. H. Barr, president of the National Founders' Association discussed the safety work of the National Affiliated Safety Organizations and also outlined the plans of the conference board to extend its activities into the field of industrial education. Mr. Barr made an earnest plea that the American Foundrymen's Association join in this work. Mr. Barr advised the meeting that the National Founders' Association would be glad to co-operate with the American Foundrymen's Association in its proposed plans for the employment of a cost expert. A motion was passed empowering the executive board to take such action as it may see fit on the recommendations contained in the annual address of President Bull. The committee on the deaths of Thomas D. West and Edgar H. Mumford presented appropriate resolutions, which were unanimously adopted.

At the final business session Friday morning, Oct. 1, the usual resolutions of thanks were presented by Benjamin D. Fuller and unanimously adopted. A motion made by Joseph T. Speer that President Bull's action in appointing certain committees since the 1914 convention be approved also was unanimously adopted. Mr. Speer's motion contained the proviso that the president be empowered to appoint such additional committees as may be necessary during the forthcoming year. Mr. Fuller stated that the city of Cleveland hoped to have the pleasure of entertaining the allied foundry organizations at the 1916 meeting. A similar invitation was received from the New England foundrymen, who suggested that the next convention be held either at Boston or Providence. These invitations, in accordance with the usual custom, were referred to the executive board for action. The motion to adjourn the convention was presented by J. S. Seaman.

Committees

The president announced the appointment of the following committees for the ensuing year:

STEEL FOUNDRY STANDARDS.—Dudley Shoemaker, Atlantic Foundry Co., chairman; A. F. S. Blackwood, Michigan Steel Casting Co., Detroit; W. A. Janssen, Bettendorf Co., Davenport, Ia.; L. A. Way, Duquesne Steel Foundry Co., Coraopolis, Pa.; Ralph West, West Steel Casting Co., Cleveland; A. H. Thomas, Buckeye Steel Castings Co., Columbus, O.

SPECIFICATIONS FOR MALLEABLE IRON CASTINGS.—Enrique Touceda, Albany, N. Y., chairman; Alfred E. Hammer, Malleable Iron Fittings Co., Branford, Conn.; W. G. Kranz, National Malleable Castings Co., Sharon Pa.; F. E. Nulsen, Missouri Malleable Iron Co., East St. Louis, Ill.

GENERAL COMMITTEE ON SPECIFICATIONS FOR GRAY IRON CASTINGS.—W. P. Putnam, Detroit Testing Laboratories, Detroit, chairman; Richard Moldenke, Watchung, N. J.; D. W. Sowers, Sowers Mfg. Co., Buffalo; Joseph J. Wilson, Cadillac Motor Car Co., Detroit. Sub-committees on hydraulic and steam engine, agricultural, pipe, car wheel and chemical castings, to be appointed later.

SPECIFICATIONS FOR STEEL CASTINGS.—To be appointed later.

SPECIFICATIONS FOR FOUNDRY SCRAP.—George E. Jones, Whiting Foundry Equipment Co., Harvey, Ill., chairman. Other members to be appointed later.

SAFETY AND SANITATION.—To be appointed later.

INDUSTRIAL EDUCATION.—To be appointed later.

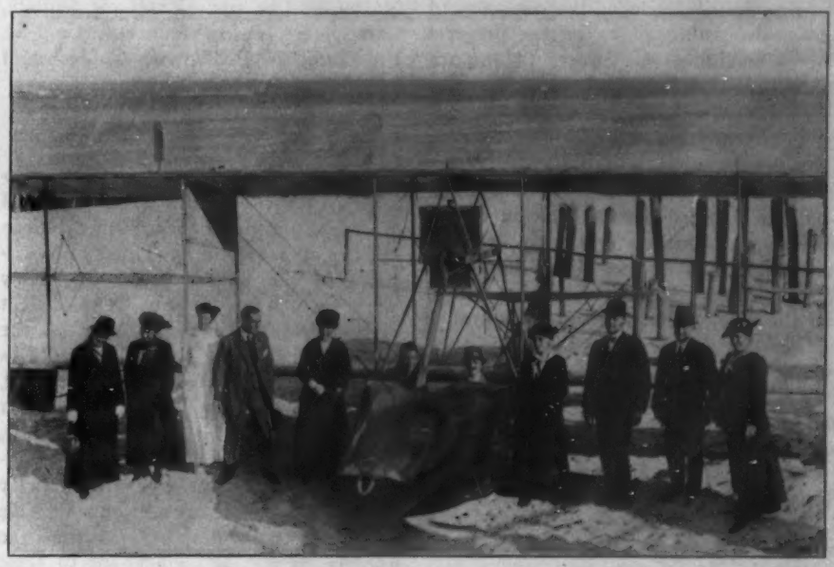
PAPERS.—To be appointed later.

COSTS.—Benjamin D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland, chairman; E. G. Felthausen, Acme Steel & Malleable Iron Co., Buffalo; H. J. Koch, Fort Pitt Steel Casting Co., McKeesport, Pa., Roy Tanner, Pittsburgh Valve, Foundry & Construction Co., Pittsburgh.

STANDARD METHODS FOR COKE ANALYSIS.—H. E. Diller, General Electric Co., Erie, Pa., chairman; Paul Debevoise, Debevois-Anderson Co., New York City; A. S. Hummell, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; R. S. McPherran, Allis-Chalmers Mfg. Co., Milwaukee; Dr. Richard Moldenke, Watchung, N. J.; J. B. Stod- W. P. Putnam, Detroit Testing Laboratory,

The numerous recreation facilities of Atlantic City afforded unusual opportunity for entertainment. An informal dance was held on Young's Pier on Monday evening. On Tuesday evening the members of the allied associations attended a theater party at Keith's.

The annual banquet at the Traymore Hotel, Thursday evening, Sept. 30, was unusually well attended and exceptionally interesting. John Kendrick Bangs presented his charming address entitled "Salubrities I Have Met", which was received with unusual enthusiasm. Dr. A. A. Hamerschlag, director, Carnegie Institute, Pittsburgh, spoke on "Foundrymen in the Making". He pointed out how difficult it is for employers to obtain men with the requisite intelligence and personality for the proper conduct of their business and he described the methods of Carnegie Institute in selecting and training young men who appear to have special endowment for positions of leadership. The creation of personality, he explained, is the all-important problem. He illustrated this idea by stating that the genius of an Andrew Carnegie was of greater value to the state of Pennsylvania than its material resources in coal and iron ore. Likewise, he felt that the ability of a man like George Westinghouse was of more consequence than the oil resources of the Pittsburgh district. The registration was unusually gratifying and showed a large increase over the Chicago convention in 1914. A total of 513 members and 209 guests were registered by the American Foundrymen's Association; the American Institute of Metals registered 114 members and 48 guests, bringing the grand total up to 884, the high water mark in the history of the allied foundry organizations.



INTERLUDES BETWEEN BUSINESS SESSIONS OFFERED OPPORTUNITIES FOR AVIATION

Institute Discusses Many Papers

Scientific Problems of Great Interest Considered at Atlantic City Meeting —Effect of War on Metal Prices Pointed Out

VALUABLE papers containing much new information in regard to aluminum and aluminum alloys, forging and rolling alloys, acid metals, bearing bronzes and other non-ferrous metals and alloys featured the annual meeting of the American Institute of Metals, at Atlantic City, N. J., Sept. 28 to 30, inclusive, in connection with the convention of the allied foundrymen's organizations. Some of the important recent developments in the metal industry, which were definitely reported and described at the meeting, included the discovery of an acid-resisting alloy; further progress in ascertaining the effects of impurities which occur in spelter; the establishment of the aluminum die casting industry on a commercial scale; the development of satisfactory methods for melting aluminum and magnalium chips; a partial solution of the mystery of "season cracking" in brass materials; the uncovering of new uses for aluminum bronze alloys by reason of the marked hardness and endurance properties of the alloys of this system; the development of continuous sherardizing equipment; the manufacture of alumino-vanadium, and the establishment of the fact that the presence of oxides is the principal cause of weakness in zinc bronze.

Friendly Criticism

Some friendly criticism was vented at the meeting, to the effect that the discussions generally were of too scientific a character to be clearly intelligible to the average brass foundryman. This matter received earnest consideration and various recommendations were voiced. As a result, G. H. Clamer, the retiring president, and chairman of the papers committee for next year, announced that among the papers to be read at the next annual convention will be one which will constitute practically an elementary treatise of the science of metals. This paper will define in as simple language as possible such terms as eutectic, thermal diagram, colloid, alpha metal and various others occurring constantly in the parlance of the scientists.

Jesse L. Jones, of the Westinghouse Electric & Mfg. Co., East Pittsburgh, was elected president for the ensuing year, while W. M. Corse, of the Titanium Alloy Mfg. Co., Niagara Falls, N. Y., was re-eelcted to the joint office of secretary and treasurer. Vice presidents were elected as follows: R. S. B. Wallace, National Cash Register Co., Dayton, O.; Geo. C. Stone, New Jersey Zinc Co., New York; W. G. Harris, Canada Metal Co., Toronto; C. B. Horne, Packard Motor Car Co., Detroit; W. B. Price, Scovill Mfg. Co., Waterbury, Conn.; E. A. Barnes, Ft. Wayne Electric Co., Ft. Wayne, Ind.; Dr. S. H. Burgess, bureau of standards, Washington, D. C.; F. H. Schutz, Mueller Mfg. Co., Decatur, Ill.; H. S. Gullick, More-James Brass & Metal Co., St. Louis, and D. B. Browne, Goldschmidt Thermit Co., New York.

Effect of War on Prices

One of the interesting papers presented at the convention, in the light of recent developments in metal market prices, was one by Thos. L. Wettstein, of the United Lead Co., New York, which dwelt on "The Effect of the Present European War on the Metal Industries". In addition to giving his own views on the subject, Mr. Wettstein's paper induced a short discussion, to which Geo. C. Stone, of the New Jersey Zinc Co., was an interesting contributor. Speaking strictly with reference to conditions in this country, Mr. Wettstein said that the nonferrous metals on account of their wide use in modern warfare, are subjected as a result of war to the widest price fluctuations ever known. "One may easily conclude that the non-ferrous metals with the sole exception of antimony," said Mr. Wettstein, "while undergoing at times wild fluctuations because of urgent covering operations attending the placing of war contracts, in the end will have been found fairly stable in values, largely due to the equalizing influence of the war demand with a largely diminishing demand from the fields of peace. Moreover, the deposits of these metals in America are so extensive that production may keep well in line with the changing demands. Antimony, however, cannot be so classified and unless new deposits are found, this metal must continue scarce, so long as a war demand exists for it in its present volume." Tin is not widely used for war purposes, Mr. Wettstein stated, and he assigned the high prices which prevailed late last year as being due to the activities of German cruisers in eastern seas. During the past six months, there have been no interruptions to the tin traffic and prices since have declined steadily.

In discussing this paper, Mr. Stone said the present situation in the spelter market is due to our having to supply 150,000 tons of spelter a year, which formerly was supplied by Germany and Belgium. Furthermore, a change in the character of the demand has complicated this situation, since, for war purposes, only the better grades of spelter are entirely satisfactory. The demand for prime western spelter now is about 50 per cent greater than normal while prices on such brands are 300 to 400 per cent higher than normal. On the other hand, the demand for high grade spelter now is 800 to 900 per cent greater than usual, in view of which, he said, it is remarkable that prices on high grade, which usually are 40 per cent higher than prime western now only are about 30 per cent higher.

Use Electrolytic Copper

W. H. Bassett, in discussing Mr. Wettstein's paper, spoke of the effect of the great spread which prevailed between the prices of lake and electrolytic copper after the war broke out. A number of ammunition makers in this country and some foreign governments, he said, when they were asked to pay heavy premiums on lake copper, decided to use electrolytic instead of lake. In a number of cases, he said, entirely satisfactory results have caused these purchasers permanently to substitute electrolytic for lake copper in their specifications and it is likely that further substitutions along this line will develop in the near future. Another speaker, questioned in regard to antimony production in this country, admitted that there are many workable deposits of antimony ore in the United States. The cost of production from these ores at the present prices would leave a good margin of profit but following the termination of the war, when normal prices again are expected, production from domestic ores could be conducted only at a loss.

In the session on forging and rolling alloys, an interesting discussion

developed in reference to the papers presented by Alfred D. Flinn, deputy chief engineer of the board of water supply of New York City, and Dr. P. D. Merica, bureau of standards, Washington. The title of the paper presented by Mr. Flinn was "Some Experiences With Brass in Civil Engineering Works". In requisitioning materials for use in the construction of the Catskill aqueduct, Mr. Flinn said, the most enduring materials were sought and, having in mind the disadvantages arising from the corrodibility of iron and steel in hydraulic structures, a strong, incorrodable metal was sought. No such metal of sufficiently low cost was obtainable, so that iron and steel was used for the most part. A large number of valves, bolts, ladders and special pipe castings, however, corrosion of which would have been exceedingly annoying, were specified in bronze, manganese bronze, brass, etc. The specifications which accompanied the contracts were so worded as to impose as few conditions on the manufacturers as possible. In spite of the care exercised, the brass, manganese bronze, etc., furnished proved distinctly unsatisfactory in most of the uses to which it was put in the Catskill aqueduct. No suspicions of definite troubles were developed until the fall of 1913. About that time, numerous bolts and rods were found cracked and additional failures since have been coming to light almost continually. Many of the materials which were cracked had not yet been installed; many still were in their packing cases. The defects were found to be general and so distributed through the output of various manufacturers that all wrought brass fell under suspicion.

Failure of Brass

The paper by Dr. P. D. Merica entitled "The Failure of Structural Brass", contained an investigation of the causes of so-called season cracking of brass with especial reference to the general failure of such material in connection with the Catskill acqueduct project. Such failures, he said, occur as far as now known, only in brass which has been worked. They are seemingly independent of composition, and fissures or fractures occur in general transversely to the direction of the working. It has been shown, he said, that such worked material is in a state of internal stress after finishing, the principal stresses being apparently in a direction parallel to the direction of rolling or drawing. Failures in brass materials similar to season cracking, are due primarily to the presence of these internal stresses and it should be the object of the manufacturer to produce material free from them. In this connection, he said, it is possible to make naval brass, practically free from internal stress. These stresses, he said, may be almost entirely removed by annealing at temperatures of about 300 to 400 degrees Cent.

Brass-Making an Art

In discussing the paper presented by Dr. Merica, Wm. R. Webster expressed the reluctance with which brass manufacturers accept specifications which are imposed on them by consumers. One reason for this reluctance is the scarcity of literature which would enable engineers to draw up satisfactory specifications. Brass-making, said Mr. Webster, primarily is an art, and the brass maker determines the suitability of his material by means of its physical properties as well as by the process and the methods of manufacture. When he receives specifications, he feels he has to alter his methods in order to secure requirements which may or may not be desirable.

Wm. B. Price, continuing the discussion, entirely agreed with Mr. Webster. He mentioned a recent case in which 20 per cent of the cartridge cases in a warehouse submerged by a flood, failed, while the remaining 80 per cent showed no signs of deterioration. An investigation revealed the fact that the appearance of cracks was confined to such cases only as were provided with primers, which led to the conclusion that cracks were due to corrosion caused by the action of moisture on the fulminate of mercury in the primers.

Jesse L. Jones, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., submitted a paper on "The Manufacture and Uses of Wrought Manganese Bronze". It contained specifications for the composition of manganese bronze bars and sheets and the limits of the permissible impurities for the constituent copper and zinc. The importance of using pure materials was emphasized and a maximum amount of ductility with a moderate degree of strength was recommended. The paper also included a description of the methods of melting, pouring and forging this alloy.

W. M. Corse, Titanium Alloy Mfg. Co., Niagara Falls, N. Y., presented a paper on "Aluminum Bronze Alloys", which contained information supplementary to the eighth report of the alloys research committee of the Institution of Mechanical Engineers of Great Britain. The hardness of aluminum bronze alloys, said Mr. Corse, is affected by heat treatment, to such an extent that this change in hardness develops new uses for the alloys. Aluminum bronze alloys of approximately 10 per cent aluminum, heated to different temperatures up to 800 degrees Cent., for instance, will give, on quenching, hardness numbers varying from 100 Brinell to 260 Brinell. Another valuable property of such bronze is its ability to withstand alternating stresses without showing fatigue. Comparing aluminum bronze with manganese bronze of the same strength, it was found that the aluminum bronze resisted stresses above its elastic limit for an average of 15,000,000 reversals in a White-Southern machine, while manganese bronze broke at less than 1,000,000. In the Landgraf-Turner endurance testing machine the aluminum bronze resisted 4,500 blows before fracture, while the manganese bronze resisted about 500.

A paper by Russell R. Clarke, Pennsylvania railroad, Pittsburgh, deplored the lack of anything approaching standardization in the composition of railroad car-journals. This paper will be published in a later issue of *The Iron Trade Review*.

G. H. Clamer, Ajax Metal Co., Philadelphia, presented a paper entitled "Effect of Changes in the Composition of Alloys used by the American Railways for Car Journal Bearings". Originally, said Mr. Clamer, it was the general opinion that a bearing should be as hard as possible and as a result, high tin alloys were used. It was not until about 1870 that soft metal linings came into vogue, eliminating, to a great extent, the occurrences of hot boxes which had become a serious source of annoyance. Somewhat later the addition of lead to the mixture was found to be beneficial, as well as economical. With increasing competition among journal manufacturers, he said, the latter sought means of cutting down their costs, using first scrap of low zinc content and finally using scrap of unknown composition and quality. This condition finally led to zinc contamination in the bearings of practically every railroad of the country. It would be highly desirable, he said, if a uniform and standard specification could be enforced on all the railroads of the country.

Slush Castings

Gilbert Riggs and Henry C. Morse presented a paper entitled "The Effects of the Common Impurities in Spelter Upon Slush Castings".

Dr. S. Trood, United States Sherardizing Co., New Castle, Pa., contributed an interesting paper devoted to the theoretical and practical prin-

ciples governing the process of sherardizing.

Ernest V. Pannell, of the British Aluminum Co., Toronto, submitted a paper on "Recent Developments in Aluminum". Since the first overhead aluminum lines for electric power transmission were strung in this country in 1898, said Mr. Pannell, there has been an annual increase in the consumption of aluminum for electrical work which has been more or less marked according as the price of copper has been high and low.

Another paper presented during the session on aluminum and aluminum alloys was that on "Aluminum Die Castings a Commercial Achievement", by Charles Pack, of the Doehler Die Casting Co., Brooklyn.

Acid Resisting Alloy

S. W. Parr, of the University of Illinois, contributed the results of an investigation designed to discover an acid-resisting alloy which might be employed advantageously as a substitute for platinum. As a result a complex alloy was developed which did not show a weighable loss after contact with nitric acid for 24 hours. The paper contained full details in regard to the composition of this alloy. Mr. Parr also contributed a paper entitled "Methods of Analysis for Complex Alloys".

A paper entitled "The Alloys of Chromium, Copper and Nickel", presented by David F. McFarland and Oscar E. Harder, gave the results of another investigation recently pursued at the engineering experiment station of the University of Illinois. The conclusion derived was that, from the present information, the alloys of chromium-copper-nickel which show possibilities of becoming of commercial value are limited to certain rather well defined ranges of composition. Such of the alloys as promise most from the mechanical and physical standpoints, show also, as a rule, the best resistance to corrosion in practically all of the solvents used.

Alumino-Vanadium

W. W. Clark, Seymour Mfg. Co., Seymour, Conn., submitted a paper containing a description of the manufacture and use of alumino-vanadium. This paper comprised data resulting from an effort to discover some form of vanadium in which the fatigue-resisting and other desirable properties of vanadium might be embodied in non-ferrous metals in the same manner as they are embodied in steel. Since pure vanadium is almost insoluble in brass, bronze, german silver, etc., an investigation was made of the suitability of its various alloys. To this end, a number of unsuccessful attempts were made to alloy the metal with copper. Aluminum finally was tried, and the results obtained were entirely satisfactory. Alloys of aluminum containing from 2 to 30 per cent vanadium were obtained and little difficulty was encountered in regulating the vanadium content. The alloys ranging from 10 to 20 per cent vanadium were most easily worked and appeared to dissolve in the brass more readily than those having a higher content. Among the difficulties encountered in the use of alumino-vanadium was the tendency of aluminum in alloys of copper and zinc and zinc and nickel, to make the metal brittle when rolling. In drawing metal, such as cupro-nickel, aluminum is objectionable as the metal hardens too quickly. Nickelo and mangano vanadiums are as easily made as alumino and except for higher melting points as easily used. It is very doubtful, the author said, that small amounts of vanadium will increase the tensile strength of non-ferrous metals, except through its effect as a deoxidizer.

Fusible Plugs

The results of an investigation of fusible tin boiler plugs were set forth in a paper by Dr. G. K. Burgess and P. D. Merica, of the bureau of standards, Washington. Tin, the authors stated, generally is used as the fusible material in boiler plugs and has many advantages in this respect. Carelessness in its use and inspection, however, often has led to boiler accidents due to the failure of the tin to function properly. Investigation of approximately 1,100 plugs, both new and used, at the bureau of standards, has shown that unless the tin used in such plugs is pure, it is subject to oxidation when in service. The oxide has a melting point above 1,600 degrees Cent. and it often forms in such a way as to prevent the blowing out of the remaining tin, thus preventing the plug from giving warning of overheating in the boiler. The tin in all cases where such oxidation occurred was impure, containing from 0.3 per cent to 5 per cent of zinc or lead. In no plugs containing pure tin was there any trace of oxidation. As the safest practice, the authors recommended for boiler plugs the use of tin 99.9 per cent pure, and containing less than 0.01 per cent each of zinc and lead, which would admit only Banca and other pure tins. The authors thought it probable, however, that tin 99.8 per cent pure and containing less than 0.01 per cent zinc and 0.50 per cent lead is sufficiently pure for use in fusible plugs, and such a specification would include most of the high grade brands of tin on the market.

Comparative Carbon Segregation of Rails

An exceedingly interesting 40-page bulletin, issued by the Titanium Alloy Mfg. Co., Niagara Falls, N. Y., covers the examination of cross-sections of A rails, the segregation in standard and titanium-treated open hearth sections being compared. These examinations were made after a discard, varying at different mills, from 8 to 10 per cent, including that at the shear and the hot saw and these examinations were made at the plants of seven of the 14 rail manufacturers of the United States and Canada. The investigation reported in this bulletin covered the examinations of samples from ingots from 111 heats of standard and 101 heats of titanium-treated open hearth rail steel. In all of the latter 0.10 per cent of titanium was used. As these heats averaged over 50 tons each, the investigation covers samples from every heat of over 50 tons of each kind of steel, or a total of more than 10,000 tons. A large number of sulphur prints have been reproduced comparing cross-sections of standard open hearth rails with rails made from titanium-treated open hearth steel. The samples for carbon analysis were taken from identical points in each rail and the analyses of the carbon in the standard open hearth rails, without exception, show a wide variance in the carbon content at two different points, whereas only a particularly small amount of segragation exists in the titanium-treated open hearth rails. For example, the difference in the carbon at two specified points of one open hearth rail was 10.2 per cent and in the titanium-treated rail 3.1 per cent. In another case, the carbon variation in the open hearth rail was 21.7 per cent and in the titanium-treated steel, only 5.1 per cent. The examinations throughout, with a few exceptions, show by far less carbon segregation in the titanium-treated rails than in open hearth rail steel not so treated.

A section of this bulletin also is devoted to a comparison of samples from centers of heads and flanges of 25 standard and 25 titanium-treated open hearth A rails.

Contract for Fuses.—The Spanish government has placed an order with the Ansonia Mfg. Co., Ansonia, Conn., for 250,000 shrapnel fuses. The value of the contract, which was placed through L. L. Driggs & Co., and associates, is approximately $1,250,000.

Iron and Money: Fact and Comment

Wild Speculation in Stocks Continues—American Bonds Sold by English Holders Are Quickly Absorbed

LAST WEEK was another period of great activity on the New York stock exchange. Although Great Britain has been selling bonds of American railroads at an astonishing rate, these bonds have been taken by the insurance companies and other investors in large blocks and the absorption has gone along so quietly as to be hardly noticed. The announcement of the agreement as to the loan to be made to the French and English allies was a factor of importance in the market, whose total sales amounted to the immense number of 8,299,579 shares. For the first four days, the aggregate was over 6,000,000 shares. The syndicate which has been handling the latest issue of $45,000,000 New York City bonds announces that it has been taken and buyers seem to be anxious to invest in anything desirable offered.

The Financial Chronicle says:

"The speculation of the stock exchange is passing all bounds and the market is assuming a runaway character. To say that the mania furnishes occasion for grave solicitude is to state what must be perfectly obvious to everyone not bereft of senses. The truth is, the skyrocket performances now being witnessed on the exchange are of such a meretricious nature that it is surely inaccurate to use the word speculative in connection with them. They are of a type that is best described as gambling. These operations, too, are being conducted with frenzy characteristic of gambling. * * * Whither all this will lead no one can tell, but that a day of reckoning must come is as certain as the rising and setting of the sun. Newspaper reports this week have been to the effect that the banks are demanding larger margins on their loans. We did not suppose they were loaning at all on the kind of things that are engaging the attention of the giddy crowd."

The market started in Monday at a lively rate, with business exceeding a million and a half shares. Baldwin Locomotive rose 18¼ points, General Motors made another sensational advance of 18¼ points, and Republic Iron & Steel made a net gain of 4 points. There was considerable activity in other steel stocks.

There was some profit taking Tuesday, with a check to the very rapid advances of the first day of the week, but the total sales exceeded 1,800,000 shares, while the bond sales amounted to $5,673,000.

For the third consecutive day, business on Wednesday exceeded 1,500,000 shares. Trading was irregular and there were numerous losses. Sloss-Sheffield Steel & Iron attracted some attention. Steel common touched 79⅝, a new mark for the year, but closed with a slight net decline.

Following a bear raid, Thursday, there was a swift recovery. It was announced that large corporations engaged in the manufacture of munitions will subscribe liberally to the Anglo-French load. Advances in copper shares were a feature of the day.

United States Steel common was the center of interest Friday, when it reached 81¾, the highest point in four years. General Motors resumed leadership in advances of war stocks, going up 25 points to 340, which, with the dividend added, makes a figure of $390 a share.

The short session Saturday opened with light trading, but activity soon set in. American Car & Foundry Co. reached the highest level of its history. Willys-Overland also made a new record, and United States Cast Iron Pipe & Foundry, Pressed Steel Car and other shares scored advances.

Quotations at the closing of business Oct. 2 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Oct. 2.	Net chg.
American Can	65½	+3½
American Can, prfd.	108¼	+ ¾
Amer. Car & Fdy. Co.	95	+20½
Amer. Car & Fdy. Co., prfd.	116	—1
American Locomotive	71¼	+9¾
American Locomotive, prfd.	99½	+1½
American Steel Foundries	64	+9¼
Baldwin Locomotive	126¼	+30¾
Baldwin Locomotive, prfd.	112⅞	+5⅜
Bethlehem Steel	375	+19
Bethlehem Steel, prfd.	160	—10
Colorado Fuel & Iron	62¾	+7¾
Continental Can	116⅞	+26⅛
Continental Can, prfd.	109	+3
Crucible Steel	105½	+9½
Crucible Steel, prfd.	110⅛	+1⅞
General Electric	178	+4
International Harv. of N. J.	106½	+ ¾
International Harv. Corp.	70	+½
Lackawanna Steel	88⅛	+9⅛
Nat'l Enamel'g & Stamp. Co.	32	+4
Nat'l Enam'g & Stp. Co., prf.	92	+3
Pressed Steel Car	74	+9½
Pullman Palace Car	160	+ ¼
Republic Iron & Steel	55	+8
Republic Iron & Steel, prfd.	103⅝	+2⅛
U. S. Cast Iron Pipe & Fdy.	28½	+8½
U. S. C. I. Pipe & Fdy., prfd.	49	+8
United States Steel	81⅜	+3⅛
United States Steel, prfd.	114½	+ ¼
Westinghouse Mfg.	138½	+18¾

The following table shows changes in maximum quotations of stocks not listed on the New York stock exchange:

	High for Oct. 1.	High for Sep. 24.
American Ship Building	37⅛	37
Cambria Steel	75	66
Chicago Pneumatic Tool	88½	90
Inland Steel	274	...
LaBelle Iron Works	46½	41½
Lake Superior Corporation	10⅛	10⅛
Pennsylvania Steel, prfd.	88½	88½
Stewart-Warner Speed. Co.	78⅛	75
Warwick Iron & Steel Co.	10⅛	10⅛
Westinghouse Air Brake	143½	144
Westinghouse El. & Mfg. Co.	65¾	62

Plant Sold

Rahway, N. J.—The plant of the New Jersey Steel Co., together with the contents, was sold at master's sale on Sept. 30. The plant brought $40,000 and the equipment approximately $6,500 more. It is generally believed that the Bethlehem Steel Co. was the real purchaser. J. Fithian Tatem, of Camden, N. J., and Philadelphia; W. J. Allison, of Philadelphia, and C. J. Beers, said to represent the Riverside Steel Co., were the principal buyers. These men worked together, apparently, and it was generally conceded that they represented a common interest. Tatem was one of the solicitors for the complaint in the receivership of the company.

The buyers were reticent as to the future of the plant and would make no statement, but it was hinted that the plant would soon be started up as a munition factory.

Canadian Locomotive Report

Toronto, Sept. 28.—The annual report of the Canadian Locomotive Co., of Kingston, Ont., for the year ending June 30 shows manufacturing profits of $130,027, being a decrease of $204,087 as compared with the previous year. The company took the balance of $303,300 carried forward from last year to help to meet the regular preferred dividend of $105,000. Of the residue $25,000 was received for special replacements and $75,000 transferred to reserve for depreciation, the balance carried forward being $142,801. The twelve-month covered by the report embraced about eight months of inactivity due to lack of orders. In January the management made a successful effort to secure orders abroad. A selling agency was established in London resulting in numerous inquiries from foreign

countries. An order from the Russian government for 50 locomotives was secured and subtantial contracts from the British government have been received. The total amount of contracts now on hand from these two sources exceeds $3,000,000, and the extensions of plant and equipment involved an outlay of $158,469.

Plenty of Orders

Toronto, Oct. 5.—At a meeting of the directors of the Nova Scotia Steel & Coal Co., Sept. 29, at New Glasgow, N. S., the general manager presented a highly satisfactory statement to the effect that orders on hand would keep the plant in operation at the present high rate of production for at least six months, and that negotiations for further orders were in progress. Government orders received during September were 40 per cent over the amount of orders for August. Though no official announcement on the subject was made, it is understood in financial circles that the directors are considering a proposition made by a strong syndicate for the purchase of $1,500,000 common stock which remains in the treasury. The deal is regarded as likely to go through, as it would enable the company to close additional large orders.

Installing Electric Furnaces

Installation of smaller types of electric furnaces in crucible steel plants in this country apparently is making further progress. One cause for this tendency is attributed to the increased cost of crucibles brought about by war conditions. Shipments of clay from Germany have been shut off while those of graphite from Ceylon have been restricted. The United States Steel Corporation has granted four more licenses for Heroult electric furnaces which brings the total number of furnaces now installed or building in this country and Canada, to 27.

The Latrobe Electric Steel Co., Latrobe, Pa., which now has a 6-ton furnace, has ordered a second 3-ton unit for the manufacture of special high grade and tool steels. The Belle City Malleable Iron Co., Racine, Wis., will use a 3-ton furnace instead of present crucible capacity.

Reports that the National Tube Co. has adopted plans to enlarge mills at Wheeling, W. Va., and McKeesport, Pa., are officially denied.

From Canada

Pig Iron is Being Shipped Via New Orleans to France

Chicago, Oct. 5. — The steamer THOMAS J. DRUMMOND is lying at the Illinois Central dock in Chicago harbor discharging a cargo of 2,000 tons of standard bessemer pig iron from a blast furnace in Canada. This iron is being loaded by the Illinois Central railroad and a solid train of about 40 cars will run direct to New Orleans where it will be loaded on ship for a destination in France.

This seems a roundabout route for pig iron and the natural outlet would be through the St. Lawrence or to Buffalo and New York and thence by ocean to France. However, under present conditions cargo space is difficult to obtain on the Atlantic and a ship has been chartered from New Orleans at a rate much less than could be obtained from New York. The rate for transportation from Chicago to New Orleans is remarkably low, the railroad offering a figure almost beyond belief for full train loads of material for export.

Malleable Plant Expands

The Hammond Malleable Iron Co., Hammond, Ind., which has been established less than a year, is building two additions which will be ready for use within a few days. A core room 50 x 120 feet is being added to the foundry building, making the latter now 120 x 390 feet. Three core ovens and a core storage room are provided in this addition. A building 20 x 100 feet close to the railroad track serving the plant is being erected for sand and brick storage. Both structures are of concrete, in keeping with the remainder of the plant.

This new company has specialized in automobile and agricultural implement parts and has been busy from the first. H. J. Wanner, president of the company, formerly was associated with a foundry at Terre Haute, Ind., before forming the Hammond Malleable Iron Co.

Will Build at Chicago

The Wheeling Corrugating Co. of Wheeling, West Virginia, manufacturer of sheet metal and sheet metal products, has bought a site and will construct a plant costing $200,000 at Arthington street and Campbell avenue, Chicago. The site is 135 x 627 feet and is served by the B. & O. and Pennsylvania railroads. The main building will be four stories reinforced concrete construction and the other structures will be of brick and steel. Paul Gerhardt has prepared the plans. The branch here is to take care of the western and northwestern business of the company and will be in charge of A. W. Crostly.

Busy Toledo Company

Toledo, O., Oct. 5.—The Jos. L. Skeldon Engineering Co., is enjoying an active call in its line from various sections of the country. The concern is at work now on a $15,000 order, including engines and boilers for the American Steel Package Co., at Defiance, O. A new boiler plant is being installed for the electric lighting plant at Columbus Grove, O., a job amounting to about $8,000. A big contract has just been secured by this concern for the construction of a power plant and installing equipment at Bogalusa, La., for the Louisiana Fibre Board Co. This contract amounts to about $100,000. Another contract on which the company is at work is an electric light plant to be installed at Spencerville, O., which will cost about $10,000. The Skeldon company has taken over the old Ricard boiler shop at the corner of Water and Vine streets and will put it in first class condition, occupying it as an extension of its own shop. The new shop is four stories, 50 x 150 feet. The new shop was badly needed to take care of the rapidly increasing business of the concern.

Wants Armored Motor Cars

The Lucey Mfg. Co., 233 Broadway, New York City, has inquired for 200 armored motor cars, each of which is to have two machine gun turrets revolving independently and to be superimposed to allow a maximum fire zone. The armor protecting the driver, gunners and important parts must be able to withstand German sharp bullets. The remainder of the armor is to be unpierceable at 75 paces. The cars are to be lined with noise-deadening material. They will carry five persons, in addition to the driver and 6,000 cartridges. The tires are to be filled with elastic rubberoid masses. The cars are to be of 50 horsepower each, capable of a speed of 40 to 53 miles per hour forward and 17 miles per hour backward. The ground clearance is to be 28 centimeters.

The Republic Iron & Steel Co. will complete a new battery of 75 by-product coke ovens within the next 30 days. The addition will give the company 143 ovens, contracts for which were awarded the H. Koppers Co., Pittsburgh.

Openings for American Machinery

Special Agent of the United States Visits Southern Republics and Gives Hints of How Trade Can Be Extended

J. A. MASSEL, special agent of the United States to promote the exporting of machinery to South America, is doing excellent work as he travels about the country, telling manufacturers the results of his investigations. Before going to South America for the department of commerce, Mr. Massel spent 10 years in the tropics in various capacities, as draftsman, engineer, salesman and manager of the engineering and machinery department which he organized in Porto Rico. He was also manager of one of the largest sugar plantations in Cuba. In the southern countries he represented the Fulton Iron Works, St. Louis, International Steam Pump Co., New York, American Machine Tool Works, Boston, Honolulu Iron Works and other manufacturing concerns. Speaking of opportunities in South America, Mr. Massel said to a representative of *The Iron Trade Review*:

"Between the date of Dec. 19, 1914, the date I left New York, and June 24, 1915, the date of my return, I visited the republics of Argentina, Chile, Bolivia and Peru, calling on all the principal machine shops, importers of machinery, industrial plants, etc.

"The most important market for our machinery is beyond question the republic of Argentina, followed by Chile, Peru and Bolivia in the order named. Argentina, besides being the largest of the republics named, its area equaling that of entire Europe, outside of Russia, has also the largest population, about 8,000,000, which population is of great help in her progress industrially and commercially.

"While Argentina is purely an agricultural country, ranking fourth in the world as a wheat and corn producing country, Chile is both agricultural and mining; Bolivia, mining; so is Peru, and if you will take into consideration sugar cane and cotton, it is an agricultural country as well. The machinery trade outside of agricultural implements is almost entirely in the hands of Europeans.

"The United Kingdom and Germany occupy the first two places respectively, and we in some instances rank third. The electrical machinery and supplies are almost in the hands of the Germans, they practically controlling every electric light and power plant in South America, excepting Peru, which is in the hands of English and American capital at this time.

"The principal importers of machinery are either English, German or Italian, carrying immense stocks of machinery and machine tools. While Argentina has numerous machine shops, there are only a very few which have a modern and complete equipment, but their railroad shops and government works are excellently equipped.

"I doubt very much whether Argentina will ever engage in machinery manufacturing, for the simple reason that they have not the necessary raw materials, which they import mostly from Europe and, therefore, they will always depend on foreign manufacturers for the supply of machinery.

J. A. MASSEL

"Chile is the only country to my knowledge in South America which actually engages in building locomotives, having two shops in Valparaiso, each one of which builds twenty 20-ton locomotives a year for the government. Chile has all the raw material required for manufacturing purposes, like coal, iron ore and copper, and the policy of the Chilian government is to encourage the development of home industries.

"Bolivia offers a market for mining machinery. It has immense possibilities as a mining center, and there is a great deal of room for developing and improvement, but it is far more remote than the other republics I visited.

"Peru is a very promising country. It is rich in cotton, sugar cane, rubber and gold, silver and copper mines. It is especially promising as a sugar country, and will offer a good market for sugar machinery and machine tools, as practically every sugar factory is equipped with a machine shop. Their present sugar factories are equipped mostly with Scotch machinery, some of them with French and German, none with American.

"While I was in Buenos Aires, an invitation was extended to me as a representative of the United States government to inspect the National Industrial School. I did so, and was surprised not only at the extent of equipment, but at the attendance as well. There are something like 500 students from all parts of Argentina, taking special studies, with practical instruction in the use of machinery and machine tools. These young men, upon graduation, go out into all sections of the republic and take responsible positions. With only a very few exceptions all of the machinery installed in the school's industrial plant is from Germany or England, most of it being in the form of donations from German firms. The United States manufacturers have a very slight representation among the models compared with their importance as makers of machinery. I believe this lack of exhibits is a serious thing for our manufacturers from a trade point of view. The school, which is under the control of the Argentine government, is sending out every year a highly trained class of men, who naturally, when connected with private industrial plants, favor the makes of machines with which they are familiar."

Blowing in Stacks. — The Thomas Iron Co. has decided to blow in its No. 10 Hellertown, Pa., furnace. J. E. Thropp Jr. is superintendent of this plant. The company put into effect Oct. 1 an increase of about 10 per cent in the wages of its men at the Richard mine, Wharton, N. J., and also at the Hokendauqua furnace. A similar advance was made at the Alburtis furnace, Sept. 16. The Empire Steel & Iron Co. has blown in its No. 3 furnace at Catasauqua.

New Rate

From Pittsburgh to Coast Will Probably Soon be in Force

Action by western railroads, following the example of the Chicago, Milwaukee & St. Paul, is about to put into effect a 55-cent rate on finished steel products from Pittsburgh to Pacific coast points. The effect of this is to establish practically a "postage stamp rate" in the territory between the Buffalo-Pittsburgh line and the Missouri river, a territory which formerly had an 80-cent rate.

When much lower rates by water through the Panama canal were established railroads sought permission to make a low rate to the coast regardless of intermediate points and were given permission to apply a rate of 55 cents from Chicago. This resulted in Pittsburgh getting a rate of 73.9 cents.

This differential gave Chicago steel mills some advantage which will be wiped out by extension of the flat rate to the entire territory. It is believed eastern roads will consent to accept 10 cents as their portion of the through rate, leaving 45 cents for the western lines. If this is the case, it is believed eventually shippers in the Chicago district will be able to obtain a rate of 45 cents per 100 pounds from Chicago to Pacific coast points, as this will be equivalent to the revenue derived under the through rate from Pittsburgh.

Steamship Line

Chicago, Oct. 4.—Announcement is made by Walter Parker, general manager of the New Orleans Association of Commerce, that within six or seven weeks the Southwestern Steamship Co. will establish service between New Orleans and San Francisco, Los Angeles and the west coast of Mexico. Executive offices are at 702 South Spring street, Los Angeles. Permanence of this service will depend upon traffic originating in the Mississippi valley. It is stated that New Orleans has assured the line considerable tonnage of freight, but this must be supplemented by other material from farther north.

Interested shippers may obtain more definite information from Mr. Parker or the offices of the company.

Taylor Memorial Meeting

The Society to Promote the Science of Management issues a cordial invitation to all persons interested in scientific management and the work of the late Frederick W. Taylor to attend the special memorial meeting to Mr. Taylor, to be held at 6:15 p. m., Friday, Oct. 22, in Houston Hall, University of Pennsylvania, Philadelphia.

The program includes as speakers several who have been closely associated with Mr. Taylor and are best qualified to speak on the important periods of his career and various phases of his work as well as the effect of scientific management on future social and industrial development. Distinguished leaders of the movement in foreign countries are preparing appreciations which will be read. Among these are Prof. A. Wallichs, Royal Polytechnical School, Aix-la-Chapelle; M. Henri Le Chatelier and M. Charles de Preminville, Paris; M. Charpy, director of the St. Jacques Steel Works; Prof. J. Sederholm, University of Helsingfors, Finland.

The secretary of the society, Prof. Henry W. Shelton, Hanover, N. H., will be glad to furnish those interested with further information.

Busy Plant

Toledo, O., Oct. 4.—The Toledo Shipbuilding Co. is now extremely busy operating with 400 men on the payroll. The force will soon be augmented by 600 men, making 1,000 employes who will work throughout the winter, according to information recently made public. As heretofore stated, the concern has just closed contracts with an eastern syndicate to build two auxiliary steel schooners for the Atlantic coast trade. The new boats will be 261 feet in length, 43 feet wide and 23½ feet deep. They will be equipped with 400-horsepower, oil-burning engines.

Death of Richard R. Williams

Richard R. Williams, for 30 years hardware editor of *The Iron Age*, who long had occupied a high position in the trade journal field, died on Sept. 30 at his home in Glen Ridge, N. J., aged 72 years. He was born in Waterford, Ireland, and came to this country with his parents in 1851. Mr. Williams' father, at Middletown, N. Y., in 1855, established the *Hardwareman's Newspaper*, which later became known as *The Iron Age*. The family moved to New York in 1863. Mr. Williams entered the Union Theological Seminary and was ordained a minister in 1870. He became pastor of the Reformed Dutch Church at Canajoharie, N. Y., in 1870, where, after remaining 14 years, he gave up the ministry and joined the staff of *The Iron Age*, later becoming its hardware editor. Mr. Williams was one of the organizers of the Hardware Club of New York in 1892, and for two years was its president. He was much interested in Sunday school work. He was a chess player of renown, and largely through his efforts the international matches with England were arranged. A wife, a daughter and two sons survive him.

John E. Thompson, for many years a partner in the firm of John W. Quincy & Co., New York City, dealers in pig iron, died at Warren, R. I., Sept. 26, aged 75 years. Death was due to a sudden attack of heart disease. The firm of John W. Quincy & Co. is not now in existence.

Robert Lemuel Greenlee, of Chicago, vice president of the Northwestern Foundry Co., president of the Northwestern Stove Repair Co. and vice president of the Greenlee Foundry Co., died Sept. 28 at a sanitarium at Battle Creek, Mich. He went to Chicago with his twin brother, Ralph S. Greenlee in 1862 and was engaged continuously in machinery manufacture in Chicago since that time.

William Watson, secretary of the American Academy of Arts and Sciences since 1884, and a noted authority on technical education, died Sept. 30 at his home in Boston, aged 82 years. After graduating from Harvard, he became a member of the faculty as an instructor in mathematics and calculus.

From 1865 to 1873, he was professor of mechanical engineering of the Massachusetts Institute of Technology. Since then he had devoted his time to special work. Prof. Watson had had many honorary offices conferred upon him in the scientific world, both in this country and abroad. He was the author of many mathematical text books.

John W. Bookwalter, Springfield, O., largest stockholder in the James Leffel Co., of that city, died Sept. 26 at his villa at San Remo, Italy. Death was due to bronchial pneumonia. Mr. Bookwalter was 76 years of age, and his estate is valued at $10,000,000. When a young man, he invented a turbine water wheel, and formed the James Leffel Co. to manufacture it. Later he invented the process for the manufacture of Bookwalter cast steel, and but recently refused an offer of $2,000,000 for his patent. Besides his large interests in the iron and steel business, he owned 70,000 acres of land in Nebraska, and was reputed to be the leading cereal farmer of the world.

Business News of Nation's Capital

Speculation as to Probable Action on the Tariff—Elements of Uncertainty Due to the War

Washington, Oct. 5.—Business dislocation throughout the world, combined with the approach of the coming session of congress, has revived lively talk of tariff revision. Published reports are not lacking to prove that a "high authority" has given assurance that the Underwood-Simmons act will be overhauled and real protection provided in it. Other printed reports have been cited to prove that a "high authority" has made it plain that the tariff will not be revised—at least not until after peace is restored in Europe. Just at this time, however, the neutral position, which does not indicate what may or may not be done with the tariff, seems to be the safest. Taking an eminent place in connection with the tariff-revision question is the fact that no specific statement has been published with the name of the "authority" used showing precisely what the administration is willing to do, or has planned to do.

Developments based upon recent activities and statements of high government officials have, nevertheless, thrown some interesting sidelights on the question of revised tariff legislation. But until something really concrete has resulted it seems that nothing but inference as to what will be done to the tariff by the present administration can be drawn. There are those who are firmly of the opinion that the administration itself has just begun a study of the tariff situation and by no means has determined upon a legislative program.

To Revalue Goods

It is worth while to observe what has taken and is taking place in connection with the tariff discussion. On Sept. 22 there was issued by Assistant Secretary of the Treasury Andrew J. Peters, at the direction of Secretary of the Treasury William G. McAdoo, a letter to the appraiser of merchandise at New York. This letter made the request that goods coming into the New York port, which had been detained in Europe, should be revalued, so that ad valorem duties could be based upon the present market value, which is considerably higher than the market value was when they were purchased prior to the war. The goods affected are principally those which have been held up in Germany and Austria as the result of England's order-in-council. The value of the goods runs into hundreds of millions of dollars. The effect of the order not only means added revenue for a well nigh depleted treasury, but effects a temporarily protective tariff on those goods which are subject to a duty.

The President's Letters

On Sept. 26 there were made public two letters written by President Wilson, relating to the tariff. In one of them, which was a reply to former Governor James M. Cox, of Ohio, the President intimated that he would not be averse to the creation of a tariff commission. This was considered by many to be quite a concession on the part of the President, some construing it to be equivalent to an admission that the Underwood-Simmons act lacks of being perfect. At the same time, however, the President said, existing organs of the government—the federal trade commission and the bureau of foreign and domestic commerce, department of commerce—have the full powers which might be bestowed upon a tariff commission. The other letter made public at the same time the Cox letter was published was written by the President to Powell Evans, a prominent Democrat of Philadelphia, in which the President said that "until the present European war is over and normal conditions have been restored, it will not be possible to determine how readily or how completely the business of the country has adjusted itself to the new conditions." The President continued and said that "instrumentalities already created will be ready and in operation which will show just where the laws are working in harmony with the facts and where they are not". The letter to Mr. Evans was written previous to the one sent to Mr. Cox. Neither letter, it is plain, commits the President to fixed policy.

During the past week Secretary of Commerce William C. Redfield wrote a letter to Dr. E. E. Pratt, chief of the bureau of foreign and domestic commerce, in which he attempted to convince American manufacturers that they would be protected from the wholesale dumping of foreign goods at cheap prices upon the markets of this country. The letter also showed that Mr. Redfield intended to avoid, so far as possible, any proposal for tariff revision. It has not been held, however, that Mr. Redfield was acting as the mouthpiece of the President when he indicated opposition to tariff revision. The President on one occasion resented a statement that a prominent member of congress in an interview was supposed to be voicing the President's attitude. President Wilson said at that time that he had a tongue of his own and would use it whenever he desired to express his attitude on any question.

Mr. Redfield's letter is supposed to have followed numerous conferences on plans for dealing with the trade situation after the war. Mr. Redfield said to Mr. Pratt in the letter that "if the question arises as to the attitude of the department of commerce toward what is called 'dumping' after the war shall end, you may say that I shall recommend in my annual report that unfair competition from abroad shall not be permitted to injure a legitimate American industry any more than it is permitted to do so in our domestic field." He said he would be glad to receive suggestions from practical commercial men as to the most efficient means of detaching and preventing unfair competition. He implied plainly that he would recommend enactment of an anti-dumping clause for the tariff act. No intimation of a specific nature was given in this proposal, however. How far Mr. Redfield would go toward anti-dumping legislation is left for speculation. It is taken as a matter of course that anyone in authority would prevent unfair competition from abroad or at home. The bureau of foreign and domestic commerce, following Mr. Redfield's letter, issued a statement, showing the operation of anti-dumping laws of Canada and other countries.

Expunge Anti-Dumping Clause

The Underwood-Simmons tariff, as a matter of fact, carried an anti-dumping clause when it passed the house, but was stricken out by the senate committee on finance. Efforts of house conferees to have the clause restored, though vigorous and almost successful, were defeated through the insistence of Senator John Sharp Williams, a conferee of the upper house, who said he would never under any conditions agree to an anti-dumping clause. The President is understood to have recently conferred with Secretary Redfield and Chairman Joseph

E. Davies, of the federal trade commission with regard to having an anti-dumping clause enacted.

Then followed the plan of the federal trade commission, which determined to send out a list of questions on foreign trade matters to every manufacturer in the United States. Among other points it is intended to develop through this questionaire is the matter of competitive trade conditions from abroad which have to be met, including such matters as the cost of production, wages of laborers, freight rates, etc. In this work the commission is also working through consular agents of the state department and commercial attaches of the department of commerce. The treasury department is at work, in conjunction with the department of commerce, compiling data on the revenue possibilities of the tariff act for the use of the ways and means committee of the house when that committee meets informally in November to begin work upon a program for revenue legislation—and possibly for protective legislation of some sort.

The entire discussion of tariff revision is shot through with currents and cross currents of mere speculation. Surmises of varying character are drawn, but until something more definite has shaped itself, there seems to be no authority whatever to say what will be or will not be done with the tariff under the present administration.

Pennsy's Brief

Washington, Oct. 5.—The Pennsylvania railroad has filed a brief with the interstate commerce commission, replying to one recently filed by the Buffalo Union Furnace Co. and the Wickwire Steel Co., dealing with freight rates the two furnace interests have to pay on coal and coke to Buffalo and Harriet, N. Y. The complainants protested principally against the payment of $1.85 per gross ton on coke from the Connellsville region, while their competitor, the Rogers-Brown company pays $1.05 on coke from Tyler and Sykes, Pa., having an interest in the coke plants there and consuming virtually all of their output.

The Pennsylvania railroad brief says that the continued participation by that carrier in the $1.05 rate cannot properly affect the rate from the Connellsville district and that public policy does not require it to withdraw from its participation in the rate. Its withdrawal, says the brief, would mean that the traffic instead of going in Buffalo via Driftwood would be delivered either to the Buffalo & Susquehanna railroad at Wellsville or to the Erie railroad at Ansonia. It is further declared that the $1.05 rate is available to the complainants as well as to the Rogers-Brown Iron Co., as the former could establish coke ovens on the line of the Buffalo & Susquehanna. The brief alleges also that the Rogers-Brown interests had offered to dispose of their coke plants to the complainants.

Virginia Rate

Washington, Oct. 2.—Rehearing of the Virginia pig iron rate case has been set by the interstate commerce commission for Oct. 20 in Washington. The case was reopened at the request of complainants. They protested that when the original decision in the case was handed down, reducing rates on iron from Virginia furnaces to points north, the lower levels were applied only to those points specifically named in the commission's order and only on the lines of those carriers which had been made defendants. It was contended by the complainants that the carriers, while following the letter of the decision evaded its spirit.

Will Not Arbitrate

Washingon, Oct. 5.—Filed with the interstate commerce commission was a statement prepared by members of the railroad commission of West Virginia rejecting a suggestion that the federal body arbitrate the freight rate differentials between West Virginia, Pennsylvania and Ohio bituminous coal fields on lake cargo coal. It is asserted by the West Virginia commission that the federal commission cannot arbitrate and has no authority to make its findings through arbitration binding upon the carriers concerned. Ohio and Pennsylvania carriers contend that differentials of from 38 to 40 cents per ton should be given in their favor against coal from West Virginia, whose transportation involves a longer haul than from Ohio and Pennsylvania mines. The West Virginia commission is opposed to increases on freight rates from coal mines in that state to interior points, amounting to 15 cents.

"A Remarkable Feature"

Washington, Oct. 5.—Secretary Redfield of the department of commerce has awarded the contract for the construction of a new United States coast and geodetic survey vessel to the Manitowoc Shipbuilding & Dry Dock Co., Manitowoc, Wis. The contract price was only $189,000 for the bare hull and machinery, but the ultimate cost of the vessel fully equipped will be $220,000. The new vessel, to be called the SURVEYOR, will be a steel steamer of about 1,000 tons displacement with triple expansion engines and will use crude oil. In the statement announcing the award, the department of commerce says, in part:

"A remarkable feature of the award of this contract lies in the fact that a shipbuilding company located on Lake Michigan should build an ocean going vessel destined for service in Alaska. This brings home the important commercial fact that after all the Great Lakes extending far into the interior of the American continent are for all practical purposes a part of the Atlantic ocean."

New Jersey's Output of Iron Ore

Trenton, N. J., Oct. 4.—New Jersey continues to be a steady producer of magnetic iron ore although only five mines were operated during 1914. Of these two are in Morris county, two in Warren and one in Passaic. According to figures collected by Dr. M. William Twitchell, of Trenton, of the state geological survey, in cooperation with the United States geological survey, the total quantity of iron ore mined was 350,135 long tons, an increase of 24,830 tons over 1913. The total quantity marketed was 846,820 long tons valued at $1,076,208, an increase in quantity of 24,830 tons and in value of $95,900. Since 1870 the mines of New Jersey have yielded 20,490,407 long tons. The gradual diminution of the number of active iron ore mines in the state does not mean that the ore deposits have been worked out. It does mean, however, that under the present conditions of competition with Lake Superior and Cuban ores, only a few of the New Jersey deposits are economically available. These conditions will probably prevail for many years to come, but eventually many of the mines now idle will be reopened.

Extensive improvements at the Mount Hope mines of the Empire Steel & Iron Co. were completed during the year, and this plant now has a modern equipment in every respect. Electric haulage in the mine, improved hoisting facilities, and much additional magnetic separating equipment give a daily capacity of 1,000 tons.

Bids will be received until Oct. 12 by sanitary district of Chicago, John McGillen, clerk, 910 South Michigan avenue, for 750 tons of fabricated steel, 1,100 tons erected steel and 375 tons of reinforcing steel.

News of Employers and Employes

Pratt & Whitney Employes Go On Strike—Wage Increases and Shorter Hours Granted in Numerous Plants

ABOUT 1,000 of the 3,200 employes of the Pratt & Whitney Co., Hartford, Conn., a branch of Niles-Bement-Pond, New York, have struck for a change in working conditions. These include an 8-hour day with no reduction in pay, time and a half for overtime and double pay for Sundays and holidays and the reinstatement of two men said to have been discharged because of activity in union affairs. The Pratt & Whitney plant, one of the largest in Hartford, is devoted to the manufacture of small tools and of what is generally known as precision machinery, such as engine lathes, turret lathes, millers, gear cutters and like machinery, in which work it engaged before the present European war. It has a $1,250,000 contract for an arsenal for the republic of China.

Nearly 150 machinists and helpers of the Max Arms Machine Co., Bridgeport, Conn., struck Sept. 28, alleging that there had been discrimination against their leaders. Two weeks ago the men's demand for a 48-hour week and an improvement in working conditions was granted.

The strike of 180 employes of the Van Norman Machine & Tool Co., Springfield, Mass., has been settled and the men have returned to work. The company concedes a 50-hour week the rest of the year and a 48-hour week beginning Jan. 1. The men are on day work and wages are not affected.

The molders, coremakers and laborers employed at the Vulcan Iron Works, New Britain, Conn., who have been on strike, have returned to work. The molders will receive a minimum of $2.75 and prices will range to $3 and a little over. Similar treatment is to be accorded the coremakers, and the laborers will also receive a satisfactory wage, declares General Manager E. G. Hurlbut.

Wage Increases

Several concessions have been offered employes of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., by E. M. Herr, president of the company. A number of employes identified with the American Federation of Labor, the International Brotherhood of Electrical Workers and the International Association of Machinists, several weeks ago asked Mr. Herr to reinstate one of the members of the union; to adopt an 8-hour day; to grant an increase of 20 per cent in wages; to pay time and one-half for overtime and to recognize the union.

President Herr refused to recognize the union, but voluntarily offered to reduce hours to a slight extent and to give an increase in pay. Concessions offered by the company are explained in a statement made by President Herr, which follows:

"After a full and complete discussion of the matters which you have brought to my attention as requests from our employes in the shops in the matter of hours of service and wage conditions, it has been decided to grant to all of our shop employes on check an average 8-hour and 40-minute day instead of the average 9-hour day, or a 52-hour week instead of a 54-hour week. The adjustment of wages will be made to the nearest half cent to give the same weekly wage for 52 hours now obtaining for 54 hours.

"In addition, the company for the next calendar year, beginning Oct. 1, 1915, will grant a bonus to all shop employes of 6 per cent on the earned wages, payable in progressive quarterly installments, as soon as possible. The new shop hours will begin Friday, Oct. 1, 1915."

Employes accepted the company's offer at a special election last Friday.

The Dunbar Bros. Co., inc., Bristol, Conn., spring manufacturer, has granted its employes a nine-hour day with 10 hours' pay.

The plant of the C. J. Root Co., Bristol, Conn., has gone on a new schedule, providing for 55 hours' pay with but 50 hours work for the day men and the piece workers have been advanced proportionately.

The strike at the plant of the American Graphophone Co., Bridgeport, Conn., which has been in progress since Sept. 9, has been settled. Under the terms of settlement, the 2,000 employes will work 48 hours a week and get an increase in wages varying from 4 to 24 per cent. There will be no recognition of the shop committee of the union.

About 700 of the 1,200 men employed in the Hill shops of the Hendee Motorcycle Co., Springfield, Mass., struck Sept. 27 and an effort is being made to call out the 400 men employed in the East Springfield shops. The men are on an eight-hour day by the week, but want the time divided differently.

Only five of the 850 Hendey Machine Co. strikers returned to work when the factory was reopened at Torrington, Conn., Sept. 27, after being closed four weeks. The announcement that pickets would be equipped with cameras to take the pictures of the men who returned to work may have deterred some who were planning to go back, but the company expects that the men who are willing to work will return in a few days.

The strike of the machinists at the plant of the B. F. Perkins Co., Holyoke, Mass., has been settled, the men accepting the offer of the company of a 50-hour week with time and a half for overtime and double time for Sunday, the wages to remain the same and the employes to be taken back without discrimination.

Demands Made in Cincinnati

Cincinnati, Oct. 4.—The following demands have been made by the local machinists' union, of the machine shops in this city:

Rule No. 1.—Forty-eight hours a week shall constitute a week's work and shall be worked as follows: Eight and one-half hours for the first five days and five and one-half hours on Saturday, and there shall be no reduction in wage from the present weekly rate.

Rule No. 2.—All overtime work after regular hours shall be paid for at the rate of time and one-half, except Sundays and holidays, which shall be paid for at the rate of double time. When a holiday falls on Sunday, the following day shall be observed.

Rule No. 3.—The company agrees to meet a committee representing the employes at any time a grievance may arise in the shop, and that there shall be no discrimination against any employes who from time to time may be elected to represent his fellow workers.

Rule No. 4.—The above rules are effective from the ..... day of October, 1915, and shall remain in effect for one year and thereafter until 30 days' written notice is given by the employer or the employes desiring a change thereto.

The above rules have been submitted to practically every machine shop in this city.

Market Impeded by Tool Shortage

Demand for Large Lathes Increases—Bethlehem Steel Co. Places Contracts and Fore River Shipbuilding Corporation to be in Market

BUYING of shell-making machinery the past week has run strongly to the large-size lathes for 6-inch or heavier projectiles. The activity in this line, while not involving so many machines, was marked. Some sellers disposed of several hundred lathes of the 24 and 30-inch types for deliveries running far into next year, and the production of their plants now is well sold up. Some builders report they are sold out on the 24 to 30-inch sizes to midyear, others until the third quarter. The buyers of these large lathes have been mainly domestic manufacturers who have closed shell contracts with the French, English and Russian governments. Shrapnel-sized lathes are difficult to find for this year's shipment except in small odd lots. A New York state builder, who had about 50 machines, disposed of these in the week.

The Bethlehem Steel Co. during the week distributed among different builders a considerable part of its inquiry for equipment for its machine shop extensions, which had included 300 to 400 heavy duty engine lathes, cranes and other equipment. At the rate at which the business was placed the past week, the list will be disposed of shortly. The Wm. Cramp & Sons Ship & Engine Building Co. has purchased about a dozen tools, consisting of punches and shears, bending and straightening rolls, a large plate planer and a scarfing machine for its new ship shed. The Fore River Ship Building Corporation is about to distribute a similar list of approximately 25 tools.

Crane Market Active

THE phenomenal activity in cranes continues. Some prominent builders state that their September business in eastern territory was the largest in their history. New orders of the past week called for about 30 additional cranes. The Maryland Steel Co. has placed one 75-ton, one 50-ton, two 25-ton, seven 10-ton and two 5-ton cranes with the Alliance Machine Co.; the Wm. Cramp & Sons Ship & Engine Building Co. seven additional 10-ton travelers with Pawling & Harnischfeger, Milwaukee; the Bethlehem Steel Co. two 20-ton travelers with the Alliance Machine Co. and three 10-ton machines with Pawling & Harnischfeger, to be installed in the machine shop extensions of the Lehigh plant; the Guerber Engineering Co. two 10-ton cranes to the Cleveland Crane & Engineering Co., while the American Car & Foundry Co. bought one 10-ton Niles and one 10-ton Pawling & Harnischfeger crane for Berwick, Pa. The Milford Foundry Co., Milford, Mass., recently took a 10-ton crane from Pawling & Harnischfeger. The Newport News Ship Building & Dry Dock Co. is figuring on a 75-ton crane, which has been up for some time. Pending inquiries now represent a small total.

Month Record-Breaker for Pittsburgh Dealers

SEPTEMBER proved to be the most profitable month in the history of the machine tool interests of Pittsburgh, and indications are that October will witness a continuation of buying on a large scale. One firm, which has sold hundreds of machine tools to domestic consumers for the manufacture of war material, has just booked an order for 200 engine lathes for foreign shipment. Second-hand machinery dealers are shipping engine and turret lathes to all of the entente nations. Demand for second-hand equipment never was so active as at present.

The Shelby Steel Tube Co., a subsidiary of the National Tube Co., Pittsburgh, which is doubling capacity at its seamless tube works at Ellwood City, Pa., has sent out inquiries for a number of machine tools and rolling mill equipment. The contract for cranes has been awarded the Alliance Machine Works, Alliance, O. The Youngstown Sheet & Tube Co. has just awarded contracts for coal-dumping and coal-handling equipment for its new by-product coke plant. The Carnegie Steel Co. has bought additional punching and shearing machinery for one of its plants. Inquiries for six electric cranes of 10 and 15 tons capacity have been sent out by one of the steel manufacturers in western Pennsylvania.

Chicago Dealers Handicapped

MACHINE tool dealers in Chicago are unable to fill the contracts for tools which have been tendered them. Deliveries from manufacturers are being received by those who had sufficient confidence in the situation to give continuous orders, but others find it impossible to obtain new machines. Sales rooms are almost empty and only those machines for which there is little demand remain in stock. Inquiry from foreign as well as domestic sources continues heavy, but almost all sales can be traced indirectly to the war. Second-hand machinery is particularly scarce and it is difficult to pick up tools of this kind.

Strike Did Not Materialize

THE threatened strike of machinists in Cincinnati, which was to have taken place on Sept. 29, did not materialize. A number of workmen in the plants of the Cincinnati Shaper Co., and the Oesterlein Machine Tool Co. left their work on that date when these companies refused to grant an eight-hour day with the same pay for a 48-hour week that they have been giving for 52½ hours. Other plants, however, have succeeded in maintaining their working forces intact. Both skilled and unskilled labor is more plentiful than six months ago, and as machine tool orders for future delivery are gradually decreasing, manufacturers do not care to obligate themselves further by paying higher wages. Practically every machine tool builder in Cincinnati voluntarily advanced the pay of their machinists 10 per cent a few months ago.

Demand has centered on small bench tools for the past two weeks. New inquiries for lathes and milling machines are not as numerous as heretofore, but shops making these tools have sufficient orders to run them well into the first half of next year.

Map of Eastern Section of United States showing Central Location of Massillon

Just the right Location for Service

The Ancient Greeks whose slogan was "AGATHON," which means "highest quality," were largely a commercial people.

"AGATHON" was the solid rock upon which they founded their everlasting reputation.

Part of their success, however, was due to the fact that before they built up a city, they selected the site that would best facilitate their purpose.

Massillon, Ohio, was selected by us as the home of The Central Steel Company because it best facilitates **our** purposes.

It is but a few miles from the Geographical Center of the Iron and Steel business of the United States.

It has most excellent facilities for quick shipment. In fact we can make **overnight shipments** to most northern points.

No matter where YOU are, WE are not far away.

"AGATHON" STEEL and "AGATHON" SERVICE

That's what **you** want.

"AGATHON" Chrome Nickel
"AGATHON" Vanadium
"AGATHON" Chrome Vanadium
"AGATHON" Silico-Manganese
"AGATHON" Nickel Steels
"AGATHON" Chrome Steel
"AGATHON" Special Analyses
"AGATHON" High Carbon

Any shape you wish—

Bars, plain or special for cold drawing or machining. **Cold Rolling Strip Stock; Billets; Slabs; Blooms.**

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

DETROIT OFFICE

326-27-28 Ford Bldg. F. Walter Gulbert, District Sales Manager

EASTERN STATES

ELLSWORTH, ME. — Tentative plans are being considered for the erection of a 100 x 250-foot factory building for the Blood Knitting Mills Co.

ELIZABETHPORT, N. J. — The S. L. Moore & Sons Corporation, is taking bids for the erection of plate and machine shops, which will form a part of the new ship building department of this concern.

GIBBSBORO, N. J.—The 5-story building of John Lucas & Son, Inc., paint manufacturers, was damaged by a $100,000 fire.

GLOUCESTER, N. J.—Contracts for an extensive plant for the Welsbach Co. have been awarded. The plant will comprise four reinforced concrete buildings, including a 3-story warehouse for rough stores, 80 x 280 feet, a 3-story warehouse for finished stores, 80 x 280 feet, a 3-story manufacturing building and hardening rooms, 60 x 270 feet, with two wings, 70 x 120 feet, and a 3-story manufacturing building, 80 x 300 feet.

NEWARK, N. J.—The Breese Carburetor Co. will build a 2-story, 70 x 70-foot addition.

NEWARK, N. J.—City of Newark will erect a 2-story, 32 x 85-foot, meter testing building.

NEWARK, N. J.—The contract for a large pumping station for the Passaic Valley sewer commission, has been awarded to Wm. G. Sharwell, 377 Firth avenue, New York City.

NEWARK, N. J.—Western Tool Co. has been incorporated to manufacture tools; $125,000 capital stock; by Charles W. Johnson, J. W. Ekstadt, Jersey City, N. J. and G. A. Ekstadt, Garwood, N. J.

NEWARK, N. J.—Butterworth-Judson & Co. will erect a plant consisting of three 1-story buildings to be 61 x 31 feet, 198 x 60 feet and 60 x 112 feet, respectively. The McClintic-Marshall Co. has the general contract.

NORWICH, N. J.—The Norwich Wire Basket Co. will erect a 75 x 200-foot, 2-story building.

PLAINFIELD, N. J.—Pond Machine Tool Co. has been granted a permit for erecting a 2-story brick addition.

RUTLAND, VT.—The Howe Scale Co. has purchased the business of the Springfield Scale Co., Springfield, O., from the Winters-Coleman Co. and will remove it to the buildings just completed at Rutland.

BOSTON.—The R. & S. Machine Co. has been incorporated; $50,000 capital stock; by Walter S. Railsback and Marion E. Cole.

BOSTON.—The state has sold John B. Finley, president of the Colonial Steel Co., Pittsburgh, a site containing 12,500 square feet of land at the corner of D and Fargo streets where a building will be erected by the National Fireproofing Co. for the Colonial Steel Co.

OTTER RIVER, MASS.—The new concrete plant of the Otter River Board Co. was damaged by a fire. The main building, a 2½-story, 40 x 125-foot structure, was the most seriously damaged.

PALMER, MASS.—A. W. & J. Rathbone have started work on a 1-story, 40 x 100-foot wire mill

QUINCY, MASS.—The Fore River Ship Building Corporation, which took bids on two 15-ton locomotive cranes, has postponed final action in regard to the purchase of this equipment.

WATERTOWN, MASS.—The contract for a 1-story, press shop 85 x 115 feet, for the United States arsenal, has been awarded to the H. P. Converse & Co., Boston.

BRIDGEPORT, CT. — The Ashcroft Mfg. Co. will erect a steam gage factory, 50 x 202 feet, five stories. Aberthaw Contracting Co. has the general contract.

BRIDGEPORT, CT. — Bridgeport Brass Co. is erecting a casting shop, 60 x 80 feet. Samuel Austin & Sons Co. have the general contract.

BRIDGEPORT, CT. — The Bridgeport Projectile Co. has closed a general contract with the Samuel Austin Sons & Co. for a forge shop, 100 x 400 feet.

BRIDGEPORT, CT. — The Remington Arms-Union Metallic Cartridge Co. has awarded a general contract to T. J. Pardy for an ammunition factory, 60 x 1,240 feet.

NEW HAVEN, CT.—The Eastern Machine Screw Co. has let a contract for the erection of a 1-story, 50 x 100-foot machine screw factory.

NEW HAVEN, CT.—The J. H. Parrish Co. has been incorporated to manufacture all kinds of vehicles; $25,000 capital stock; by James H. Parrish, Thomas T. Bright, and Carroll C. Hicks.

WATERBURY, CT.—Waterbury Tool Co. has had plans prepared for a machine shop and office building addition.

WINDHAM, CT. — The Smith & Winchester Co. has begun work upon a foundry, 85 x 69 feet.

PAWTUCKET, R. I. — The Lorrain Mfg. Co. has awarded a contract for the erection of a 2-story brick addition to the office building.

PROVIDENCE, R. I.—The Gorham Mfg. Co., Elmwood, R. I., has awarded a contract for the erection of three 1-story additions to its plant.

BROOKLYN, N. Y.—Chelsea Fibre Mills Co. has had plans prepared for a brick, 4-story plant to be erected at 1135 Manhattan avenue and Commercial street. The estimated cost is about $30,000.

BUFFALO.—The Atlas Steel Casting Co. has awarded a contract for an addition to its foundry; E. C. Shong is vice president.

BUFFALO.—The Curtiss Aeroplane Co. has let contracts for a 4-story, 80 x 300-foot addition.

BUFFALO.—The Buffalo Copper & Brass Rolling Mills will erect a 42 x 50-foot boiler house.

BUFFALO.—The Unique Brass Foundry Co. has plans prepared for a foundry, 85 x 136 feet, one and two stories.

BUFFALO.—The Jewell Steel & Malleable Co., 373 Hertel avenue, will build a 1-story, 64 x 80-foot core room addition.

CORTLAND, N. Y.—A 1-story addition, 50 x 110 feet, will be built by the Cortland Carriage Goods Co.

DUNKIRK, N. Y.—The American Locomotive Co. will build a 1-story, 22 x 30-foot hydro-oxygen plant.

LOCKPORT, N. Y.—The Fibre Corporation will rebuild its plant which was recently damaged by fire.

NEW YORK.—The Thatcher Furnace Co., 131 W. Thirty-fifth street, will build a 2-story addition to its plant in Newark, N. J.

NEW YORK.—The E. R. Merrill Spring Co., 526 West Twenty-eighth street, has plans under way for the erection of a 1-story, 95 x 97-foot factory building.

ROCHESTER, N. Y.—The Eastman Kodak Co. will build a 2-story, 45 x 140-foot addition.

SOLVAY, N. Y.—Pass & Seymour, Inc., Boyd building, will build a 1-story, 40 x 45-foot addition.

TONAWANDA, N. Y.—McKinnon Chain Co. will build a 1-story, 80 x 90-foot addition, to cost $10,000.

UTICA, N. Y.—W. A. Jamieson, 1124 Howard avenue, will build a 1-story, 25 x 65-foot manufacturing plant.

UTICA, N. Y.—The Hassellbarth-Whiton Co., manufacturer of iron and brass beds, springs, etc., has purchased a site and will enlarge its plant to care for increased business.

CHESTER, PA.—Keystone Casting Co. will build a fireproof addition, to cost $30,000.

CONNELLSVILLE, PA.—West Penn Traction Co., with headquarters at Pittsburgh, has completed plans for the installation of a complete power unit of 19,000-kilowatt capacity at the local plant. The increase will involve an expenditure of approximately $1,000,000.

ERIE, PA.—Erie Silk Mills have awarded Henry Schenk Co. the contract for a 1-story, 144 x 144-foot steel addition to their works.

HARRISBURG, PA. — State water supply commission has approved the application of commissioners of Mercer county to construct a bridge across Yellow Britches run in Delaware township.

HARRISBURG, PA.—The state water supply commission has approved plans submitted by the Pennsylvania railroad to build a bridge across Dotter run in Rockland township, Venango county; a bridge across Mill creek in Rockland township, Venango county; a bridge across Catfish run in Madison township, Clarion county.

JOHNSTOWN, PA.—City of Johnstown will build a concrete arch bridge across Stony creek at Haynes street.

JOHNSTOWN, PA.—G. A. Fink, Harrisburg, Pa., is preparing plans for the Horner street bridge, to cost $45,000.

PHILADELPHIA.—Defiance Mfg. Co. has increased its capital stock from $50,000 to $150,000.

PHILADELPHIA.—The Southwark Foundry & Machine Co. has let a contract for alterations to its 1-story, 50 x 200-foot foundry.

PHILADELPHIA. — The Wm. Cramp & Sons Ship & Engine Building Co. is about to commence the erection of a 2-story shop building, 78 x 219 feet.

PITTSBURGH.—Painter-Dunn Co. will build a 2-story garage and storage building.

PITTSBURGH. — Allegheny county commissioners will erect a bridge over Saw Mill run near Elwyn Station.

PITTSBURGH. — Pennsylvania railroad will build a bridge over Crisswells run in Indiana county.

PITTSBURGH.—Fawcus Machine Co. has increased its capital stock from $200,000 to $300,000.

PITTSBURGH.—Pittsburgh Annealing Box Co. has increased its capital stock from $5,000 to $100,000.

PITTSBURGH.—The Pennsylvania railroad will build a concrete and steel bridge at Cresson to replace the structure that collapsed recently.

PITTSBURGH.—Monongahela River Consolidated Coal & Coke Co. has completed plans for the erection of ice breakers along the east bank of the Monongahela river at Gallatin Mine, Forward township, Allegheny county.

PITTSBURGH.—The Alton Steel Co., which has a strip steel mill at Alton, Ill., plans to resume operation. An extension to the plant is being considered. W. C. Fownes, Pittsburgh, is interested.

PITTSBURGH. — Railway Supply & Equipment Co. has been incorporated to conduct a general foundry, casting and machine business from all kinds of metals by Kate G. Small, A. D. Starrett and W. A. McCoy, all of Pittsburgh.

PITTSBURGH. — Projectile Protector Co., capital stock $100,000, has been incorporated

by W. P. Limley, Pittsburgh; Richard T. Brown, Wilkinsburg, Pa., and Charles R. Guyer, Wilmington, Del., to manufacture protector coverings for projectile, shells, shrapnel, etc.

STOYESTOWN, PA.—Stoyestown Water Co. has increased its capital stock from $5,000 to $10,000.

SYRACUSE, PA. — Greene county commissioners have completed plans for a bridge across Ten Mile creek.

BALTIMORE, MD. — The Baugh Chemical Co. will erect an acid plant, 75 x 210 feet.

BALTIMORE, MD.—The Tin Decorating Co. has let a contract for the erection of a 1-story 18 x 72-foot addition.

BALTIMORE, MD.—The Spanish-American Trading Co., 1902 Eutaw street, Baltimore, is preparing plans for a gun cotton factory to be erected on a site recently purchased.

BALTIMORE, MD.—The Baltimore & Ohio railroad will spend about $1,500,000 on a 515 x 700-foot coal dock at Curtis bay. This dock will have a capacity of about 10,000,000 tons of coal yearly.

$100,000 capital stock; by C. H. M. Atkins, H. Cotterbein and B. B. Quillan, the latter of the Cincinnati Planer Co.

CINCINNATI.—The Cincinnati Milling Machine Co. will build a 60 x 225-foot addition. Work will begin immediately.

CINCINNATI.—The Ahrens-Fox Engine Co. has received an order for $45,000 worth of motor driven fire apparatus from the city of New York.

CINCINNATI. — Bonds for $210,000 have been sold to add to the equipment of the Kennedy Heights plant of the Cincinnati water works.

CINCINNATI.—The Herscheded Hall Clock Co. has increased its capital stock from $100,000 to $150,000. The increase will be used to extend the business of the company.

CINCINNATI.—The City Ice Delivery Co. will begin the construction for a 75-ton ice plant in about 30 days. It will be located in Price Hill. Bernard T. Wisenall, architect, Cincinnati, is preparing the plans.

CINCINNATI. — The Cisco Machine Tool Co., which recently took over the property of

tarred-gravel roof. Alexander Bros., 323 Williamson building are the contractors.

CLEVELAND.—Aetna Brass Co. has increased its capital stock from $10,000 to $100,000.

CLEVELAND.—The city board of control has awarded the United States Cast Iron Pipe & Foundry Co. $40,000 pipe contract.

CLEVELAND.—The D. H. Burnham Co., Chicago, Ill., has completed tentative plans for a union depot for Cleveland estimated to cost $17,000,000. These plans call for an 8-foot track elevation over the present level, and extensive changes in yards and bridges.

CLEVELAND.—The Standard Welding Co., 1,200 W. Seventy-third street, Cleveland, plans the erection of a 60 x 487-foot, 5-story, concrete factory addition to cost about $150,000. Crowell, Lundorf & Little, 1951 E. Fifty-seventh street, Cleveland, are the architects and general contractors.

CLEVELAND.—Earle M. White, manager of the Glengariff Realty Co., 200 Erie building, having under construction the East End market at East Forty-sixth street and Euclid

Trade Notes That Merit Careful Consideration

Roy C. Whayne Supply Co., Lincoln building, Louisville, Ky., is in the market for a 200-foot per minute air compressor to be operated by an oil engine. Also for a standard gage 10-ton locomotive crane.

Bids will be received until Oct. 13 by the board of commissioners of the port of New Orleans, La., for one 100-kilowatt and one 200-kilowatt motor-generator sets. Ford, Bacon & Davis, 921 Canal street, New Orleans, are consulting engineers.

The Shelby Steel Tube Co., Ellwood City, Pa., is in the market for a number of machine tools.

The Fore River Ship Building Corporation, Quincy, Mass., will issue an inquiry shortly on about 25 machine tools.

West Penn Traction Co., Connellsville, Pa., with headquarters in Pittsburgh, plans the installation of a complete power unit of 19,000-kilowatt capacity. The increase in equipment will involve the expenditure of about $1,000,000.

Timken-Detroit Axle Co., Detroit, Mich., will build a 1-story steel and reinforced concrete, 70 x 460-foot forge shop addition, to be equipped with 1,200-horsepower boilers, magnet cranes and 35 drop forge hammers.

Bids will be received until Oct. 21 by E. A. Schall, city clerk of Three Rivers, Mich., for the construction of a water and electric light plant to include two water wheels and generator, a motor-driven service pump, a centrifugal fire pump and an elevated steel tank, having a capacity of 150,000 gallons.

Bids will be received until Oct. 12 by the city council for the city of Monticello, Ind., for two compound duplex pumps with valves and piping. F. L. Miner is city clerk.

Cincinnati Grain Co., Cincinnati, O., will erect an elevator and warehouse, for which elevating and conveying equipment will be needed.

The city of Clinton, Ill., has authorised the issuance of $4,500 bonds for the purchase of a high-pressure fire pump or pumps to have a daily capacity of 1,000,000 gallons.

CENTRAL STATES

AKRON, O.—W. E. Wright Co., has taken over plant No. 1 of the Buckeye Sewer Pipe Co. together with 11 acres of land at Arlington and E. Exchange streets, and will enlarge. Buckeye Sewer Pipe Co. will consolidate at plant No. 2 where extensive improvements will be made.

CAMBRIDGE, O.—The Noble Construction Co., Caldwell, O., has started work on a 216-foot concrete bridge over Wills creek, Nicholson's hill.

CANTON, O.—The Canton Steel Foundry, E. G. Van Horn, treasurer, is completing the additions to its plant costing $25,000 and will install additional equipment. Improvements include four ovens, two core and two drying ovens, gas engines and electrical equipment. It is planned to rebuild one of the open-hearth furnaces.

CINCINNATI.—The Cincinnati Grain Co. will erect an elevator and warehouse. Conveying and elevating equipment will be needed.

CINCINNATI. — The Cincinnati Screw Co. has been incorporated to take over the plant of the Cincinnati Screw & Tap Co. and the Victor Stamping Co., near Loveland, O.; the Von Wyck Machine Tool Co., has leased four lots in Cumminsville near its plant on which the company will erect a building.

CINCINNATI.—The plant and equipmnt of the National Lathe Co., Batavia, O., have been purchased by the H. J. Reedy Elevator Mfg. Co., Cincinnati. The equipment will be moved at once and installed in the plant of the purchasing company.

CINCINNATI.—The Concrete Flooring Co. of Kentucky has been incorporated with a capital stock of $50,000. A plant 100 x 100 feet will be built in Norwood, a suburb, and special equipment installed for the manufacture of a patented composition flooring.

CINCINNATI. — The plant of the Modern Foundry Co., Oakley, will be enlarged by two additions. One will be 74 x 82 feet, a part of which will be used as offices, and the remainder as a service station. The other will be 30 x 210 feet, and will add to the facilities of the foundry section.

CLEVELAND.—The Agricultural Tool Co. has been incorporated; $12,000 capital stock; by John Gedeon, Gabriel Kundtz, and others.

CLEVELAND.—American Range & Foundry Co. 7,000 Union avenue, Cleveland, plans a foundry addition to cost about $6,500. The building will be 52 x 92 feet, brick with a

avenue, will take bids at once on the installation of refrigerating counters and white enameled brick stalls for the market house. Knox & Elliott, 1248 Rockefeller building, are the architects.

COLUMBUS, O. — Ohio State University plans to build a machine shop to cost $135,000; C. M. Steeb is secretary and J. W. Bradford is architect of the university.

EAST LIVERPOOL, O.—J. G. Strauss Lighting Co., East Liverpool, has taken over the plants of the Risinger Arc Light Co. and the Tri-State Light Co. and has incorporated them as the City Lighting Co.; $5,000 capital stock; by Joseph G. Strauss, president, and others.

LIMA, O.—The Solar Refining Co. plans to spend about $300,000 on a plant at South Lima. Plans call for the installation of 15 stills for the manufacture of gasoline.

LIMA, O.—Gramm Motor Truck Co., a subsidiary of the Geiger-Jones Co., Canton, O., operating the Garford plant at South Lima, has increased its capital stock from $1,250,000 to $2,500,000.

LORAIN, O.—The city of Lorain will vote Nov. 2 for a municipal lighting plant to cost about $350,000.

MARION, O.—The Interstate Iron & Steel

Co. has decided to locate its plant in Marion, to replace plant recently damaged by fire in Cambridge, O. Plans call for an expenditure of about $300,000. S. J. Llewellyn is president.

ORRVILLE, O.—The Will-Burt Co. has been established in Orrville to manufacture tool machinery. John R. Long and William Byrider, Akron, O., are interested.

SALEM, O.—Plans and specifications for the plant of the Porter Rubber Co. have been prepared and approved and the officers of company state that work will be started shortly.

SCIOTOVILLE, O.—The bridge which the Chesapeake & Ohio railroad is erecting over the river at Sciotoville is a 3,400-foot structure and will cost about $1,000,000. The bridge will be ready for use about November, 1916.

SPRINGFIELD, O.—Webster & Perks Tool Co. has increased its capital stock from $25,000 to $150,000.

STEUBENVILLE, O. — Jefferson county commissioners will receive bids until Oct. 15 for a reinforced concrete bridge in Springfield township.

STEUBENVILLE, O.—Wheeling Steel & Iron Co. has awarded Dixon & Dixon a contract for foundations for six feet tin mills to be installed at the Yorkville plant. Contracts will be let shortly for additions to the boiler house, bar shed, hot mills and furnaces and probably to the warehouse. Two recent additions to the mills are nearing completion.

WOOSTER, O. — The Central Construction Co. has been awarded a contract for the erection of a bridge between Center and Clearfield counties, Pa. The company also will erect a bridge in Penn township, Butler county, Pa.

YOUNGSTOWN, O.—The Youngstown Car Mfg. Co. contemplates the erection of an addition to its plant. William Wilkoff is president of the company.

YOUNGSTOWN, O.—G. E. Rose, president of the Realty Security Co., Stambaugh building, has completed plans for a modern 3-story office building, to be erected on North Phelps street.

YOUNGSTOWN, O.—Automatic Fire Extinguisher Co. has been incorporated; $10,000 capital stock; by A. Onorato, Carl O. Casselli, Max Hain, Louis Galajda, Frank T. Gentile and Henry Samartino.

YOUNGSTOWN, O. — The Youngstown Sheet & Tube Co. has awarded the Wellman-Seaver-Morgan Co., and the Fairbanks-Morse & Co., Cleveland, contracts for a high-lift coal dumper and coal handling equipment for the new by-product coke plant.

ZANESVILLE, O. — Armco Athletic Club plans the erection of a club house and grandstand, to cost $50,000.

BLUEFIELD, W. VA.—Engineers of the Kentucky & Virginia railroad are surveying an extension from Benham, Harlan county, up the Cumberland river into Wise county, terminating in Norton, Va., a distance of about 50 miles. A contract for the construction will be let shortly. The road opens extensive coal fields and connects the Louisville & Nashville and the Norfolk & Western railroads.

CHARLESTOWN, W. VA.—E. I. Du Pont de Nemours & Co. of Delaware, have been granted permission by Stuart F. Reed, secretary of state, to engage in business in West Virginia. A powder factory will be built at Nemours for the manufacture of munitions. It is announced that $500,000 will be spent in West Virginia for the purchase of land and the erection of plants.

HUNTINGTON, W. VA.—The Glass Brick Co. is in the market for some pressure blowers. The company recently purchased considerable steam power equipment.

LEXINGTON, KY.—The American Metallic Packing Co. is asking for prices on a second hand wheel and axle press of 200 tons capacity

LOUISVILLE, KY.—The office of United States engineer, Federal building, will receive bids until Oct. 22 for the erection of one mitering drydock with two leaves.

LOUISVILLE, KY.—The Louisville Gas & Electric Co. plans the erection of a central heating system for the business section. Donald McDonald is vice president and general manager of the company.

LOUISVILLE, KY.—The Roy C. Whayne Supply Co., Lincoln building, is in the market for a 200-foot per minute air compressor to be operated by oil engine. Also for standard gage 10-ton locomotive crane.

PADUCAH, KY. — Refrigerating and special equipment will be needed by the Creamery Co., Centralia, Ill., which will establish a plant. D. M. Farris is in charge.

ANDERSON, IND. — Madison county commissioners are having plans prepared for two 90-foot spans to be added to the Main street bridge. W. O. McVaugh is surveyor of Madison county.

EVANSVILLE, IND.—The Anchor Supply Co., manufacturer of awnings, is having plans prepared by C. Shopbell & Co., 707 Furniture Exchange building, Indianapolis, for 5-story and basement, 40 x 150-foot factory addition. Bids will be taken shortly.

GOSHEN, IND.—The Hawks Electric Co. plans the erection of a 40 x 70-foot plant addition to cost about $40,000. The company supplies Goshen, Middlebury, Millersburg, New Paris, Syracuse, Milford, Wakarusa, and Bremen, Ind., with light, heat and power. The addition will be built at the west foot of Washington street and will house a 1,000-horsepower steam engine.

INDIANAPOLIS, IND.—The county council is considering construction of two bridges over Fall creek at a cost of $75,000 and $50,000.

INDIANAPOLIS, IND.—Fire recently damaged the plant of the American High Speed Chain Works with a loss of $25,000.

INDIANAPOLIS, IND. — National Motor Vehicle Co. has had plans prepared for an additional building and heating plant to cost $30,000.

INDIANAPOLIS, IND.—H. L. Bass & Co., architects, 801 Hume Mansur building, Indianapolis, are taking bids on a power house to be erected for Stoughton A. Fletcher, president of the Fletcher American Bank, Market and Pennsylvania streets.

MARION, IND. — Atlas Foundry Co. will build a 1-story addition, 60 x 150 feet, to cost $7,000.

MONTICELLO, IND.—Bids will be received until Oct. 12 by the city council for two compound duplex pumps with valves and piping. F. L. Miner, city clerk.

MUNCIE, IND.—Inter-State Motor Co. has broken ground for a 3-story brick and steel 80 x 100-foot addition. B. W. Twyman, general manager.

SOUTH BEND, IND.—Holland Machine Co. has been incorporated to manufacture machinery; $125,000 capital stock; by William H. Holland, George Snyder and Cyrus Workinger.

BLOOMINGTON, ILL. — Authority has been granted to build a 76-foot steel girder bridge over Coops creek to replace the present structure.

CHICAGO.—The Steel Fabricating Co. has been incorporated; $50,000 capital stock; by Charles H. Aldrich, 137 South LaSalle, August Drout and Park Phipps, 8 South Dearborn street.

CHICAGO.—Wildman Boiler & Tank Co., 3458 Archer avenue will build a boiler shop 54 x 100 feet, to cost $10,000.

CHICAGO.—The Climax Cream Separator & Mfg. Co. has been incorporated; $65,000 capital stock; by Jacob Stampen, Christ Agersburg and Ole Bromsted.

CLINTON, ILL.—City council has authorized $4,500 in bonds for a high-pressure fire pump or pumps of 1,000,000 gallons daily capacity.

DECATUR, ILL.—Patton, Holmes & Flynn, architects, 401 Powers building, Decatur, have completed plans for a 1-story and basement, 66 x 152-foot factory building to be erected for the H. Mueller Mfg. Co., 512 W. Cerro Gordo street.

EAST MOLINE, ILL. — National Steel Products Co., Cedar Rapids, Ia., has decided to locate in East Moline. The company is a manufacturer of steel fence posts, steel gates and corn dryers and will occupy the old plant of the Fuller Co. which covers, 2½ acres of land.

ROCKFORD, ILL.—Barber-Colman Co. has started the construction of an addition to its plant.

ARMADA, MICH.—Ground has been broken for an electric line between Armada and Detroit, via Frazer, Berville, Capac and Yake.

DETROIT.—Detroit Steel Products Co. will rebuild an addition containing 15,000 square feet to be devoted to the manufacture of automobile springs.

DETROIT.—Timken-Detroit Axle Co. will build a 1-story, steel and reinforced concrete forge shop, 70 x 460 feet, to be equipped with 1,200-horsepower boilers, magnet cranes and 35 drop forge machines.

DETROIT.—The Kelsey Wheel Co., Windsor, Can., has awarded Wells & Gray, general contractors, a contract for the erection of an addition to its plant to cost about $10,000 and to contain six dry kilns and a garage.

ESCANABA, MICH. — Michigan Tanning & Extract Co., tanners, has purchased a site between Escanaba and Gladstone, and are having plans prepared for a brick, steel and concrete, 70 x 900-foot plant. Samuel Mills, North Escanaba, is the contractor.

KALAMAZOO, MICH.—G. G. Worden, architect, 801 Kalamazoo National Bank building is taking bids on a 4-story, 61 x 101-foot factory for the manufacture of automobile parts, to be erected for Fuller & Son, Pitcher street.

LANSING, MICH.—H. M. Verplanck and George M. Holmes are forming a company to manufacture power lawn mowers with a capital stock of $50,000.

MUSKEGON, MICH. — Western Michigan Steel Foundry Co. will build a 2-story addition, 44 x 100 feet, costing $25,000.

THREE RIVERS, MICH.—Bids will be received until Oct. 21 by E. A. Schall, city clerk, for the construction of a water works and electric light plant, including two water wheels, and generators, motor-driven service pump, centrifugal fire pump and elevated steel tank of 150,000 gallons capacity.

MILWAUKEE.—Plans will be prepared this winter for a $240,000 bridge over Milwaukee river at North avenue. J. C. Pinney is superintendent of bridges and public buildings.

MILWAUKEE.—Bids will be asked soon on a bascule bridge to be erected at the foot of State street, costing $175,000. J. C. Pinney is superintendent of bridges and public buildings.

KANSAS CITY, MO.—Carl Boller & Bros.

architects, Gaiety building, are taking bids on a 5-story theatre and office building, 90 x 160 feet for the Altman Realty Co. to cost $100,000.

KANSAS CITY, MO.—Kansas City Southern Railway will have plans prepared for viaducts costing $100,000 and for rebuilding a bridge over the Kaw river at a cost of $155,000. C. E. Johnson, chief engineer, Kansas City Southern building.

LAWTON, MO.—F. T. Sweet, Webb City, Mo., and W. S. Crane, Carthage, are building a 200-ton tailing mill on the Eastern Lead & Zinc Co.'s lease at Lawton. The plant will be electrically operated and in commission shortly.

PLEASANT HILL, MO. — The American Scale Co. of Pleasant Hill, is building a branch plant at Kansas City, Mo., for which foundry equipment is needed.

ST. LOUIS.—City of St. Louis is considering a bond issue of $1,000,000 for bridges, viaducts, grade separation and municipal docks.

ST. LOUIS.—Hyke Bros. Mfg. Co. has been incorporated to manufacture sheet metal specialties; $20,000 capital stock; by F. S., Fred and Albert L. Hyke.

ST. LOUIS.—Mercury Mfg. Co. has been incorporated to manufacture laundry and knitting machinery; $50,000 capital stock; by J. O. V. Stettin, H. L. Bonhoff and Arthur C. Eckhart.

ST. LOUIS.—St. Louis Subway & Elevated Corporation is to build 4.76 miles of elevated and 3.29 miles of subway. James D. Houseman and T. Hiesen, Bank of Commerce building, are interested.

ST. LOUIS. — Missouri Iron Co., E. F. Goltra, president, La Salle building, is having plans prepared for a blast furnace to cost $500,000, by Arthur G. McKee & Co., 1301 Rockefeller building, Cleveland, O.

WARRENSBURG, MO. — David Mohler, county engineer, is preparing plans for a steel bridge, and will be ready for bids about Dec. 1. Theodore Hyatt is county clerk.

KAWAWHA, IA.—Bids will be received until Oct. 16 by the town clerk for a 30,000-gallon steel tank on an 80-foot tower. Charles P. Chase, Clinton, Ia., is the engineer.

WAUKON, IA.—Bids will be received until Oct. 12 by the county auditor for an 80-foot, two 100-foot and a 140-foot steel bridge, H. O. Orr is county engineer.

MINNEAPOLIS, MINN.—Borne Aeroplane Co., recently incorporated by Walter R. Hauser and Arthur R. Borne, 433 Andrews building, will build a factory for the manufacture of aeroplanes and hydroplanes.

OWATONNA, MINN.—Penhallegon Radiator Co. is planning the erection of a plant to manufacture a detachable automobile radiator. W. F. St. Clair, president.

ST. PAUL, MINN.—Bids will be received until Oct. 11 by August Hohenstein, purchasing agent, for one 20-inch, three-step cone, double back geared engine lathe.

ST. PAUL, MINN.—City of St. Paul will issue $400,000 in bonds for water works extensions, including a 15,000,000-gallon pump and two venturi meters.

ST. PAUL.—Theodore A. Schultze, Foot, Schulze & Co., shoe manufacturers, has purchased a site on Robert street for the erection of a plant to cost about $500,000. Work will be started as soon as possible.

SOUTHERN STATES

NORFOLK, VA.—Norfolk & Western railroad will spend about $1,880,000 in the construction of two storage warehouses at Lambert's point to care for foreign trade.

CONCORD, N. C. — Norcott Mill, cotton mills, has awarded T. C. Thompson & Bro., Charlotte, N. C., a contract for the erection of a 106 x 210-foot plant which will cost about $175,000.

NEW ORLEANS, LA.—Bids will be received until Oct. 13 by the board of commissioners of the port of New Orleans for a 100-kilowatt and a 200-kilowatt motor generator sets. Ford, Bacon & Davis, 921 Canal street, are consulting engineers.

DENISON, TEX.—Bonds for $50,000 have been voted for an 1,800-foot steel viaduct over the Missouri, Kansas & Texas railroad property.

EL PASO, TEX.—Lone Star Motor Co. has increased its capital stock from $25,000 to $50,000.

LLANO, TEX.—Llano Motor Co. has been incorporated to manufacture and sell internal combustion engines; $50,000 capital stock; by M. D. Slator, M. M. Goss and E. G. Bogusch.

GALVESTON, TEX.—Armour & Co., Chicago, will rebuild their plant damaged by fire and will install electric elevators and improved refrigerating system at a cost of $60,000.

CORNING, ARK.—North Arkansas Utilities Co. has been incorporated to install and operate power plants and railroads; $75,000 capital stock; by G. A. Booser, C. L. Daniel, Elizabeth Morrison, H. B. Hays and Thomas Neeley.

WESTERN STATES

BLAIR, NEB.—Bids will be received until Oct. 15, S. W. Chambers, village clerk, for an electric light plant to cost $35,000. Martz Engineering Co., engineers, 416 First National Bank building, Lincoln.

FAIRBURY, NEB.—County and state are considering the construction of a 700-foot steel bridge with 20-foot roadway over Blue river near Fairbury.

LAUREL, NEB.—Bids will be received until Oct. 16 for a water works system. Bruce, Standeven & Boynton, engineers, 430 Bee building, Omaha.

ATICA, KAS.—Bonds for $30,000 have been voted for an electric light and water works system. E. T. Archer & Co., engineers, Kansas City, Mo.

WICHITA, KAS.—Plans are being prepared by Edgar V. Moore, county engineer, for four concrete and steel bridges to be constructed by the county.

WICHITA, KAS.—Frank Schwartz is erecting a 2-story machine shop, 115 x 123 feet, to cost $14,000 which is to be leased to the Aultman Taylor Machine Co., 339 South Wichita street. John Perkins, manager, is taking bids.

WICHITA, KAS.—L. O. Ripley, president of the Kansas Gas & Electric Co., announces that $1,800,000 will be spent on improvements to the company's property. The capacity of the Wichita plant will be doubled at a cost of $50,000 and an additional $50,000 will be spent on extensions. Application has been made for an increase in capital stock from $4,700,000 to $6,500,000. About $300,000 will be spent on a transmission line from Van Arsdale to Burrton. Plans are being considered to spend $60,000 on the El Dorado line and $100,000 on the plant at Pittsburgh, Kas., including enlargements and equipment.

BILLINGS, MONT.—J. I. Case Threshing Machine Co.'s local branch will build a 2-story addition to its factory at a cost of $100,000. O. J. Thomas, manager.

SUPERIOR, MONT. — Managers of the Glen Metals mine near Superior plan the installation of electrically-driven machinery.

SALT LAKE CITY.—Jennings-Hanna Investment Co. recently incorporated with $150,000 capital stock, plans the erection of a $100,000 warehouse on Second South between Second and Third West streets. J. E. Jennings and Eugene F. Hanna are interested. Plans call for 3-story, reinforced concrete, fireproof structure, with 100,000 square feet of floor space.

KELLOGG, IDA.—Albert I. Goodell, Spokane, Wash., representing the Bunker Hill & Sullivan Mining Co., has announced that plans have been completed for the installation of a smelter at Kellogg.

LEWISTON, IDA.—A. G. Nortz, president of the Lewiston-Clarkston Transit Co., announced that plans are being considered for extensive improvements of the street railroads.

BREMERTON, WASH.—W. D. Peters has applied for a 50-year franchise to operate electric or gasoline-operated railroad on the city streets.

OLYMPIA, WASH.—Wilbur B. Forshay of Portland, Oregon, is asking a franchise for 50 years to conduct a heat, light and power plant and plans to spend $200,000 in equipment if this franchise is granted.

SEATTLE.—Fire damaged the plant of the Northwestern Iron Co., 1041 Railroad avenue, south.

SEATTLE, WASH.—A contract will be let soon by the port of Seattle engineers, J. R. West, engineer, for a refrigerating system for a 7-story, 150 x 200-foot ice and cold storage building to cost about $105,000.

SEATTLE.—F. F. Travis, architect, Raleigh hotel, is general contractor for a 5-story, reinforced concrete, fireproof sanatarium to be erected in the suburbs for an association of Seattle physicians. The main building will cost about $700,000. The other buildings including a power plant, will cost about $450,000. Work will be started immediately.

AMITY, ORE.—Ralph Marvin, city engineer, plans a municipal water works to consist of a gasoline-driven pump, distributing pipe system, etc. Installation is estimated to cost about $15,000. G. L. Stannard, Portland, Ore., is the consulting engineer.

BAKER, ORE.—T. S. Kennerly has purchased the mining property of George Whited near Unity, and will install a stamp mill.

PORTLAND, ORE.—City highway commission will prepare plans for a steel span bridge over Willamette river at cost of $60,000.

CANADA

CALGARY, ALTA.—The Automatic Valve Co. of Canada, Ltd., has been incorporated; $20,000 capital stock.

MONTREAL, QUE.—The Castings Co. of Canada, Ltd., has been incorporated; $49,000 capital stock; by Harry Cohen, Alexander Ellison and Stanley G. Metcalfe.

MONTREAL, QUE.—The Harris Heating & Engineering Co., Ltd., has been incorporated; $25,000 capital stock; by Joseph A. Harris, Avila Mayer and Edgar Desy.

SHERBROOKE, QUE.—The Electric Zinc Co., Ltd., has been incorporated to operate mines, smelters and refineries; $24,000 capital stock; by Leland D. Andrews, Oakland, Cal., and Charles H. Maxcy, of Ruthaford, N. J.

SOREL, QUE.—Sorel Steel Foundry Ltd., has been incorporated; $100,000 capital stock; by Louis P. Tremblay, Napoleon Latraverse and others.

IRON AND STEEL PRICES

Corrected up to Tuesday Noon

PIG IRON

(Delivery to Dec. 31.)

Bessemer, valley	$16.00
Bessemer, Pittsburgh	16.95
Basic, Pittsburgh	15.95
Basic, eastern Pa.	17.00 to 17.50
Malleable, Pittsburgh	15.45 to 15.95
Malleable, first half, Pbgh.	15.95
Malleable foundry, Chicago	15.00
Malleable foundry, Philadelphia	16.75 to 17.25
Malleable foundry, Buffalo	16.00
No. 1X foundry, Philadelphia	16.75 to 17.00
No. 2 foundry, Pittsburgh	15.45 to 15.95
No. 2 Fdy., first half, Pbgh.	15.95
No. 2 foundry, first half, valley	15.00
No. 2 foundry, Cleveland	15.00 to 15.30
No. 2 foundry, Ironton	14.50 to 15.00
No. 2 foundry, Chicago	14.25
No. 2X foundry, Philadelphia	16.25 to 16.75
No. 2X fdy., N. J. tidewater	16.25 to 16.75
No. 2X foundry, Buffalo	16.00
No. 2 plain, Philadelphia	15.50 to 15.75
No. 2 plain, N. J. tidewater	15.75 to 16.25
No. 2 plain, Buffalo	15.50
No. 2 southern, Birmingham	11.50 to 12.50
No. 2 southern, Cincinnati	14.40 to 15.48
No. 2 southern, Chicago	15.50 to 16.00
No. 2 southern, Phila. delivery	15.50 to 16.00
No. 2 southern, Cleveland	15.50 to 16.06
No. 2 south'n, New York docks	15.50 to 16.00
No. 2 southern Boston, docks	15.50 to 16.00
No. 2 south. interior, New Eng.	16.50 to 17.50
No. 2 southern, St. Louis	15.90
Virginia No. 2X furnace	13.50 to 14.00
Virginia 2X, Philadelphia	16.25 to 16.75
Virginia 2X, Jersey City	16.60 to 17.10
Virginia 2X, Boston points	16.75 to 17.25
Gray forge, eastern Pa.	15.50 to 15.75
Gray forge, Pittsburgh	14.95 to 15.20
Gray forge, first half, Pbgh.	15.20
Gray forge, Birmingham	9.00
Silveries, 8 per cent, Jackson, O.	18.00 to 18.50
Silveries, 8 per cent Birmingham	13.00
Silveries, 8 per cent, Chicago	20.00 to 20.50
Standard low phos., Phila.	25.00 to 25.50
Lebanon low phos., furnace	20.00
Low phos., Pittsburgh	24.00 to 24.50
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	16.25 to 16.75
Charcoal, Buffalo	16.75 to 18.25
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.
(Lower lake ports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.45
Old range, non-Bess., 51½ per cent.	3.00
Mesabi non-Bessemer, 51½ per cent.	2.80

Foreign Ores.
(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	8 to 8½
For'n non-Bes., 50 to 65 per cent.	8 to 8½

COKE

(At the ovens)

Connellsville furnace	$1.75 to 1.80
Connellsville fur., last quarter	2.25
Connellsville foundry	2.30 to 2.60
Connellsville fdy. contr.	2.40 to 2.70
Wise county furnace	2.00 to 2.25
Wise county foundry	2.40 to 2.60
Pocahontas furnace	2.00 to 2.50
Pocahontas foundry	2.25 to 2.50
New River, foundry	2.50 to 3.25
New River, furnace	2.25 to 2.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., furnace (prompt)	110 to 115
Ferro mang., Balti. (future)	100.00
Spiegeleisen 20 per cent, furnace	28.00
Ferro-silicon, 50 per cent, Pbgh.	73.00 to 75.00
Ferro-silicon, 50 per cent, Phila.	73.00 to 75.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $20.00; 10 to 11 per cent, $21.00; 11 to 12 per cent, $22.00; 12 to 13 per cent, $23.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 20 cents per pound; 2 per cent carbon, 40 cents per pound, delivered.

Ferro-vanadium, $2.25 to $2.30 per pound of contained alloy, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, 50 to 55 cents per pound.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Ferro-tungsten, nominal, at $3 to $3.50 per pound of contained alloy.

Cobalt metal, $1.60 to $1.75 per pound, Pittsburgh.

Aluminum, 55 cents per pound, New York.

Ferro-molybdenum, Pittsburgh, nominal.

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$30.00 to 32.00
Forging billets, Phila.	34.00 to 38.00
Forging billets, Pbgh.	35.00
Forging billets, Chgo.	32.00
Wire rods, Pittsburgh	29.00 to 30.00
Bess. bill., Youngstown	24.00 to 25.00
Open hearth billets, Youngstown	25.00 to 26.00
Bessemer billets, Pittsburgh	25.00
Open hearth billets, Pittsburgh	26.00
Bess. sheet bars, Youngstown	24.00 to 25.00
Op. h'th sheet bars, Youngstown	25.00 to 26.00
Bess. sheet bars, Pittsburgh	25.00 to 26.00
Op. h'th sh. bars, Pbgh.	26.00 to 26.50
Muck bar, Pittsburgh	28.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbg. & Chgo.	1.25c
Stand. op.-h'th rails, Pbg. & Chg.	1.34c
Light rails 8 to 10 lbs. Pbgh.	1.40c
Light rails 8 lb. Chgo.	1.31c
Light rails 12 to 14 lbs. Pbgh.	1.35c
Light rails 12 lbs. Chgo.	1.26c
Light rails 16 to 20 lbs. Pbgh.	1.30c
Light rails 15 to 20 lbs. Chgo.	1.21c
Light rails 25 to 45 lbs. Pbgh.	1.25c
Light rails 25 to 45 lbs. Chgo.	1.16c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c to 1.75c
Angle bars st. sections, Chicago	1.50c to 1.75c
Spikes, railroad, Pbgh.	1.60c
Spikes, railroad, Chgo.	1.65c to 1.75c
Track bolts, Pbgh.	2.10c to 2.25c
Track bolts, Chgo.	2.10c to 2.25c
Tie plates, Chgo.	30.00 to 32.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago, to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.35c to 1.40c
Structural shapes, Chgo.	1.54c to 1.59c
Structural shapes, Philadelphia	1.559c to 1.659c
Structural shapes, New York	1.559c to 1.619c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.49c to 1.59c
Tank plates, Pittsburgh	1.40c to 1.45c
Tank plates, Philadelphia	1.509c to 1.559c
Tank plates, New York	1.519c to 1.569c
Bars, soft steel, Pittsburgh	1.35c to 1.40c
Bars, soft steel, Chicago	1.59c
Bars, soft steel, Philadelphia	1.559c
Bars, soft steel, New York	1.569c
Hoops, carloads, Pittsburgh	1.50c
Bands, Pittsburgh	1.35c to 1.40c
Shafting, Pbgh., contr. car loads	62 off
Bar iron, Chgo.	1.35c
Bar iron, Philadelphia	1.459c to 1.509c
Bar iron, New York	1.469c to 1.519c
Bar iron, Cleveland	1.35c to 1.40c
Bar iron, Pittsburgh	1.45c to 1.50c
Hard steel bars, Chicago	1.30c to 1.35c
Smooth finish, mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.00c
No. 28, black, Chicago	2.19c to 2.29c
No. 28, tin mill, black, Pbgh.	1.95c
No. 28, galvanized, Pbgh. nom.	3.50c to 3.75c
No. 28, galvanized, Chgo.	3.79c
No. 10, blue anld., Pbgh.	1.60c
No. 10, blue, annealed, Phila.	1.759c to 1.809c
Tin plate, 100 lb., coke base	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel, ¾ to 3 inches	79	63½
Iron, ¾ to 2½ inches	71	52
	Lap-weld.	
Steel, 2½ to 6 inches	78	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	71
Iron, 3½ to 4½ inches l. c. l.	59

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh	$1.75
Plain wire, jobbers, Pittsburgh	1.60
Galvanized wire, jobbers, Pbgh.	2.30
Polished staples, Pbgh.	1.90
Galvanized staples, Pbgh.	2.60
Barb wire, painted, jobbers, Pbgh.	1.90
Barb wire, galv., jobbers, Pbgh.	2.60